

R

INSIDE FACTS OF PROFITABLE FRUIT GROWING

1920

*Planting and Care
of
Fruit Trees, Small Fruits
Shrubbery etc.*

Presented to the L. H. Bailey Hortorium
by the Missouri Botanical Garden, 1972.



Neosho Nurseries Co. |



Index

	Page		Page
Apple —		Blight.....	38 to 41
Blight.....	41	Blossom.....	38
Borers.....	47	Canker.....	39
Cultivation.....	34	Fruit.....	39
Planting Distance.....	34	Remedies.....	40
Planting.....	19	Choosing a site.....	9, 10
Pruning.....	23, 29	Cover crops.....	21
Spraying.....	73	Digging holes.....	19
Soil.....	11, 34	Dynamiting.....	12
Thinning.....	35	Fertilization.....	21, 22, 23
Apricot.....	47	Fillers.....	27, 28
Cultivation.....	47, 48	"Heeling in" trees.....	17
Spraying.....	76	" How to beautify your home grounds".....	70
Cherry.....	49	How to handle trees on arrival.....	16
Planting Distance.....	50	How to know good trees.....	5
Pruning.....	49	Inter-Cropping.....	27, 28, 29
Spraying.....	74	Laying out the orchard.....	12, 13
Crabapple.....	36	Making your orchard produce.....	27, 28
Blight.....	41	Number of trees to acre.....	20
Borers.....	47	Order dormant trees.....	3
Cultivation.....	34, 47	Planning home grounds.....	65
Dehorning Old Trees.....	46	Planting—	
Location.....	43	On hillsides.....	15
Planting Distance.....	47	Methods.....	14, 15
Pruning.....	44	Plans.....	13, 14
Renewal Pruning.....	46	Trees.....	18, 19, 20
Soil.....	43	Pollination.....	24, 25
Spraying.....	76	Preparation of land.....	11, 12
Thinning.....	46	Pruning—General principles.....	23
Pear.....	46	Apple.....	23, 29
Blight.....	38	Apricot.....	47
Cultivation.....	37	Cherry.....	49
Dwarf Pear.....	37, 41	Peach.....	44
Fillers.....	41	Pear.....	37
Planting Distance.....	37	Plum.....	48
Pruning.....	37	Protecting roots at planting.....	19
Soil.....	37	Reason for ordering early.....	3
Spraying.....	76	Remove wire labels.....	20
Plum.....	48	Spraying.....	72 to 80
Cultivation.....	49	Apple.....	73
Planting Distance.....	48	Apricot.....	76
Pollination.....	49	Cherry.....	74
Spraying.....	76	Peach.....	76
Quince.....	41	Pear.....	76
Garden Roots.....	71	Plum.....	76
Asparagus.....	71	Blackberry.....	77
Rhubarb (Pieplant).....	71	Currant.....	76
Small Fruits.....	50, 64	Gooseberry.....	76
Blackberry.....	54	Grape.....	75
Currant.....	58	Raspberry.....	77
Dewberry.....	55	Mixtures.....	77
Gooseberry.....	57	Results.....	80
Grape.....	50	Young trees.....	77
Raspberry.....	56	Stimulating wood growth.....	34
Strawberry, Standard.....	58 to 64	Stimulating bud formation.....	35
Strawberry, Everbearing.....	64	What kind of trees to buy.....	2, 4, 7
Ornamentals—		When to order.....	3
Climbing Vines.....	68	When to plant.....	3
Hedge Plants.....	68	When shipment can be made.....	3
Iris.....	69	When to buy.....	2, 7, 8, 9
Lilac.....	68	When to prune.....	23, 24
Peony.....	69	Why trees do not bear.....	24, 25
Phlox.....	70	Winter injury, protection from.....	3
Roses.....	66	(Under paragraph on Fall planting)	
Shade Trees.....	66		
Shrubs.....	67		

FOREWORD

"Fruit-growers have the highest average prosperity of any class of farm people in the world."—Annual Report U. S. Chamber of Commerce.

Many people have taken up fruit-growing because of the profits others have made or because they felt it offered a pleasant occupation as well as a good living.

Among the most successful fruit-growers there are many business and professional men who at the start had no experience and little or no knowledge of fruit-growing or farming.

Their success was due first to careful study and planning, and then to following the right principles and methods. They were willing to learn and determined to succeed.

Now, whether one wishes to grow fruit to ship to distant markets or to supply local demands, or for one's own table, there is the same need of "knowing how."

There are many sources from which one may secure reliable information on fruit-growing, such as the State Experimental Stations, the Universities, and the United States Department of Agriculture. There are also many books on one or more phases or departments of horticulture.

But there was a great need for a simple, concise, reliable guide for the average man, and it was particularly to our own interest to furnish such a book, because success and satisfaction with the best of trees and plants depend upon the planter himself.

If you intend to ship to distant markets, you will find it best to confine your planting to a few varieties, and your choice should be governed by the following factors, arranged in the order of importance: Adaptability to your climate and soil, productiveness, hardiness, resistance to disease and insect troubles, keeping qualities, color, size, and quality.

If it is your purpose to supply local markets, it is advisable to select a greater number of varieties which ripen over a long season, and you can also lay more emphasis on quality and less on keeping qualities.

For home use, your choice should be governed by many of the same factors, but rather in this order: quality, succession of ripening, hardiness, resistance to disease and insect troubles, productiveness, and, last of all, color and size.

The greatest opportunity for the farmer and others is in supplying local markets.

Give fruit-growing the same attention and care that you would have to give any other business—farming included—and you will be amply repaid. A few years ago the average return from fruit crops was \$96.08 more per acre than from cereal crops.

You will, of course, study your own particular conditions and vary the application of the fundamental principles according to your needs.

With best wishes for your success,

Sincerely yours,

4th Edition
Copyright, 1920.

NEOSHO NURSERIES COMPANY,
Neosho, Missouri.

WHERE TO BUY TREES.



priced novelties." Circular 108, Ohio Agricultural Experiment Station.



Prof. Sears of Amherst, Mass., says: The argument of "acclimated nursery stock" has certainly been overworked. * * * The writer is thoroughly convinced of the fact that "it makes little or no difference where the tree was grown as far as climatic conditions are concerned. What does make a difference is having good thrifty stock."

"Indeed it is what a tree really is and not where or by what method it is grown that should be the determining factor of the purchase." Bulletin 217, Ohio Agricultural Experiment Station.



"The selection of trees suitable for planting is fundamental to the success of the orchard. To plant a poor tree is to start with a handicap that may continue throughout the life of the orchard." Farmers' Bulletin 776, by H. P. Gould, Pomologist in charge of Fruit-Production Investigation.

"Aside from the general healthfulness of the stock, perhaps no other factor is of so great importance as that it be well rooted. If planted in a section where there is usually an abundance of moisture and where other climatic conditions are favorable, poorly rooted stock may have some possibility of overcoming and outgrowing defects incident to a poor root system." Circular No. 51, U. S. Dept. of Agriculture, by H. P. Gould, Pomologist in charge of Fruit District Investigations.



"The section of the country from which trees are obtained is unimportant so long as the trees are well-grown, healthy, and typical of the desired varieties. The growing of good trees depends upon favorable conditions and proper management in the nursery, and these factors are not peculiar to any particular section. The inherent qualities of a variety do not change when the trees are grown in different sections of the country. If the variety is hardy, it will continue to be so; if it is susceptible to some disease, it is not made less so by growing the tree during its nursery period in some particular region." Farmers' Bulletin 917, United States Department of Agriculture, by H. P. Gould, Pomologist, Office of Horticultural and Pomological Investigations.

NOTE: Experience has proved that with proper packing nursery stock will arrive in good condition long distances from the point of shipment. Explorers for the U. S. Government are constantly sending in trees and plants from distant foreign countries. Here are a few expressions of satisfaction from our customers in far away lands:

"The trees came in perfect order and they are doing well. Your packing is very good." J. Ivison, Yokohama, Japan.

"The trees arrived in good condition." Henry S. Iselin, France.

"Your packing was perfect. The trees came in splendid condition, are planted and have started to grow." J. L. Wilson, Portugal.

"Your case of fruit trees which left yours on the 4th January last arrived here on the 19th inst., having made a very good trip up river by native boat.

"You will be interested to know that not one of the trees was dead and I take pleasure in complimenting you on the way your shipment was packed, nothing could have been better packed.

"I shall have much pleasure in recommending your name to my friends in the country. Your shipment has pleased me very much and I feel sure the trees will do well with proper care." B. M. Barry, West China, April 21, 1916.

NEOSHO NURSERIES CO.,
Neosho, Missouri.

WHEN TO PLANT

Spring Planting Trees must be planted when they are in a dormant, mature condition. Early spring is the best time for most planting, the earlier the better. A late-planted tree puts out leaves promptly, but the first growth is on the reserve food stored up in the roots and trunk. An early-planted tree starts the same way. But the early-planted tree has had time to put out the little fine root hairs, and thus draws new food from the soil sooner than the late-planted tree, which gives it a quicker start. The early-planted tree gets the full benefit of the season's rainfall, and being in the ground longer, is able to make a better growth.

In dry, arid regions where irrigation is necessary, spring planting is best; March and April are the best months to set trees in Colorado, Idaho, Utah, Arizona, etc., and the territory east of the Pacific Coast Range. In California, Oregon, and Washington, on the western slope of the Pacific Coast, where they have fall rains, the planting should be done as soon as possible after the early rains have wet the ground. Spring planting is also best in New England, New York, Michigan, and all sections north of a line drawn through the lower half of Pennsylvania across through the upper half of the State of Missouri.

Fall Planting Fall planting has an advantage in sections where the trees are not apt to be injured by the winter. A tree newly planted in the fall will not resist as much cold as one that has grown a year. Peach trees can be planted in the fall in some of the northern sections if they are protected by mounding up the dirt about them, so as to bury the tops. This is possible with a peach tree, because in pruning them they are usually cut back to 18 or 20 inches, and it is no great trouble to cover the tops with dirt after they are planted. Grape vines, gooseberries, and currants can be treated in the same manner, but it would take such a large mound to protect apple and other tall trees that it is not recommended. Fall planting is largely preferred in the middle latitudes, southern New Jersey, Maryland, Tennessee, North Carolina, southern Missouri, Indiana, Ohio, etc. In Georgia, Alabama and California winter planting is recommended, the trees to be set any time when the ground is dry enough to work, and when the weather is mild. Trees should never be handled during freezing weather.

Order Trees Early Whether you plant in the fall or spring, the trees should be ordered as soon as your plans are definitely made. Have the nurseryman reserve your trees to be shipped as soon as you are ready for them. For early fall planting get the order in during the summer. For spring planting order in January, or before.

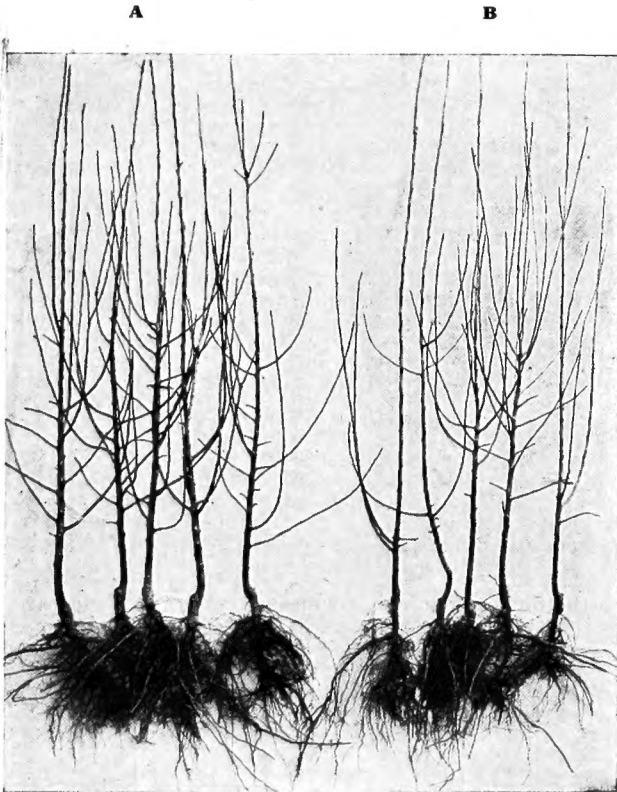
In the propagation of nursery stock, plans have to be made one to three years ahead and it is impossible to foretell just what the demand will be for the different kinds and varieties. Moreover the percentage of salable trees or plants that will be produced from the number planted in the nursery varies from year to year according to conditions over which the nurseryman has no control. The man who orders late runs the risk of not being able to get the varieties or sizes he prefers. Shipments can generally be made as early as October 15th, depending upon the weather conditions.

Securing Dormant Trees The conscientious nurseryman will not dig his trees until they are thoroughly dormant and mature, even if he loses some orders. Trees that have been dug before they have ripened naturally in the nursery row are likely to fall short of giving satisfaction to the orchardist. The shipping season usually ends by May 15th. Of course, it is better to plant late than to lose a year.

Don't Handicap Your Orchard

It is easy to tell the inexperienced fruit-grower that "the best is the cheapest," even though it costs a little more at the start. Everyone knows that. The beginner's trouble is in knowing what is best. There may be a great deal of difference in the quality of two trees, although they both answer the same general description. The top should be stocky and well formed. The roots should be strong, heavy and vigorous. The roots are the most important part of a tree, for the growth a tree makes depends upon its roots. A poorly rooted tree may eventually make a satisfactory tree, but it will be several years longer coming into bearing.

A tree should not only be the right size and shape and pruned in the nursery, but should be handled right after it has been dug. The vitality of good nursery stock is sometimes injured by careless handling, and it is impossible to detect this injury. It is important to buy from a nurseryman who is equipped to handle his trees right, and who will deliver them in a fresh, vigorous condition.



The five trees on the left (A) were graded by caliper or diameter—those on the right (B) graded by height. If graded by height only, all ten of them would go into the same grade.

It is easy for the experienced fruit-grower to tell good nursery stock when he sees it. However, those who have not had so much experience should read the ideas of some of the foremost horticultural authorities in the different parts of the country.

Professors Paddock and Whipple, in their book, "Fruit-Growing in Arid Regions," emphasize, as do all authorities, the necessity of buying good trees. They say: "The choice of trees is a matter of primary importance, and it should receive very early consideration in planting an orchard. It is very often true that the man who plants an orchard has only a vague idea of what constitutes a first-class tree, but the man is to be pitied more who knows a good tree and then plants a second-class one because it is cheaper. Cheap trees are seldom, if ever, a bargain; the grower should insist on having first-class trees, and should be willing to pay for them. The question of where the trees are grown does not seem to be so important as some persons are inclined to think. Provided the trees reach the grower in good condition, it probably matters little where they are grown. Provided the trees are equally strong and clean, it seems to matter little whether they are budded or grafted."

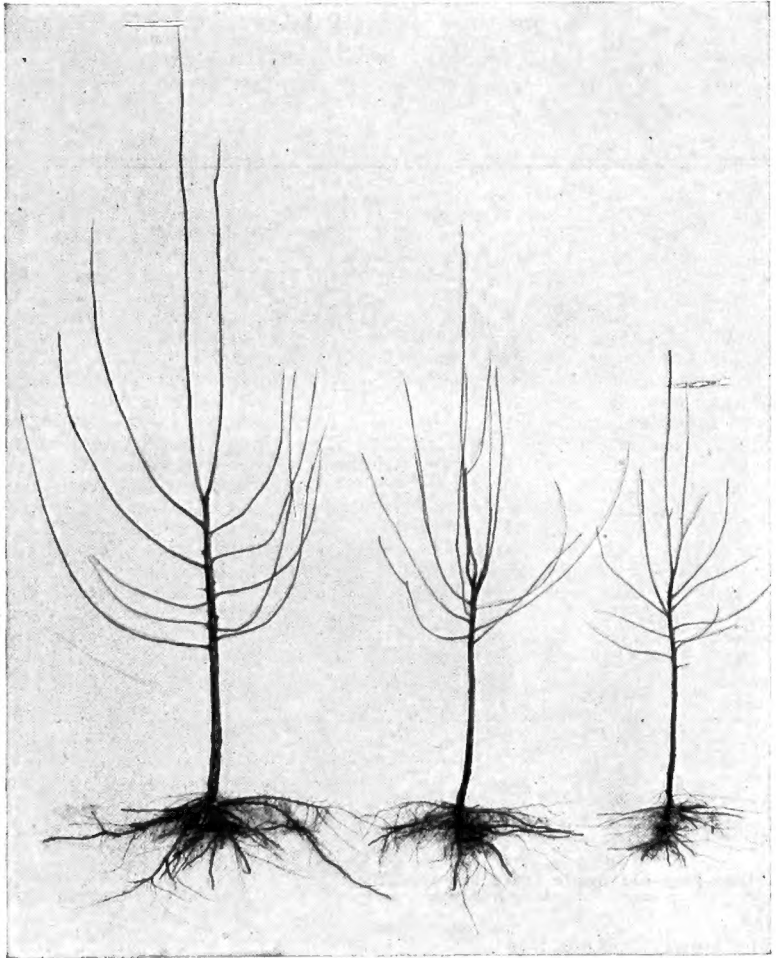
The description of a good tree by Prof. E. J. Wickson, of the University of California, in "California Fruits," is a safe guide. He says: "The trees should have a good healthy look, with a clean bark, and of size enough to indicate a good, free growth. The matter of size is not the only point to consider, for size of the top is not so desirable as well matured wood and plenty of roots. On the other hand, stunted trees are not, as a rule, worth planting, for a stunted tree, like a stunted calf, often does not make a good aftergrowth. There are cases, however, in which by extra cultivation in good soil fine trees have been grown even from 'culls' from the nursery. The best rule is to select trees of good medium size, straight and healthy. Do not purchase trees unless the roots are healthy-looking and free from knots or excrescences. Gnarly and knotty roots in the young trees are a sure sign of insect pests or of unhealthy growth, and planting such trees has occasioned our orchardists immense loss. Many have been led into purchasing poor trees because they may be had cheap. A tree selected merely because it is cheap may prove to be the most expensive thing a man can put in the ground."

Different varieties of trees have different habits of growth, and this should be borne in mind as Dr. J. C. Whitten of University of California, late Professor of Horticulture, University of Missouri, says in his book on "Apple Culture:" "Some growers select from appearances. They want big, thrifty-looking trees. For that reason they sometimes plant only such varieties as make fine growth in the nursery. Some varieties are slow growers; some are notably straggling and unsymmetrical; some tend to fork badly, while others are readily shaped well in the nursery."

Often the nurseryman can, by special cultivation and care, develop well-shaped trees from varieties that are not shapely growers. However, such varieties as Delicious Apple will always make a heavier tree in the nursery row than the Jonathan, which is a rather slim grower. Yellow Transparent will always make an upright-growing tree. Kieffer Pear will always be a heavier, straighter tree than Winter Nelis.

Professor Frank A. Waugh of Amherst, Massachusetts, has studied nursery conditions in different parts of the country, and is a practical fruit-grower. In "The American Apple Orchard," he writes: "It is the nurseryman's business to propagate trees, and he can do it better and more cheaply than the unpracticed fruit-grower. The suspicion usually attached to nursery-grown trees is almost always unfounded. The unso-

phisticated farmer has been habitually gulled by the fruit tree agents from the earliest times, but the very large majority of nurserymen are honest and reliable. They grow good trees, as nearly true to name as careful foresight can insure, and they sell them at reasonable prices. The



(XXX Size.)

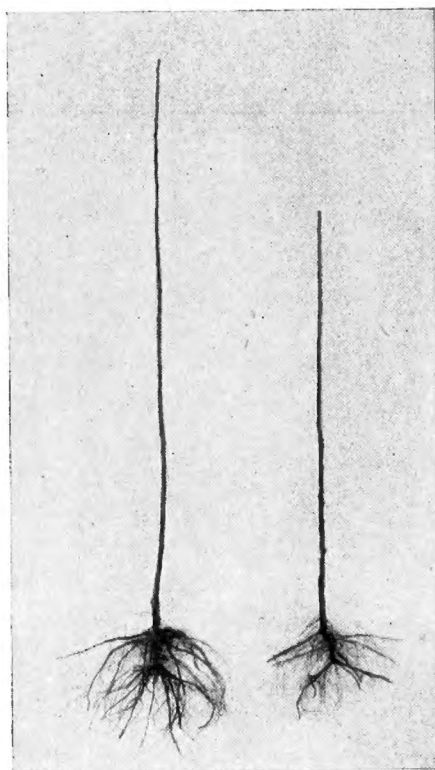
(XX Size.)

(X Size.)

Two-Year-Old Apple Trees.

Two-year-old apple trees are divided into three sizes. The extra large, when headed low, will average about 5 to 6 feet tall. When trained with medium heads, they will often run 6 to 8 feet tall. The body will average $1\frac{1}{16}$ to $\frac{3}{4}$ inch and up in diameter. The large size will run about 4 to 5 feet tall and will average $\frac{5}{8}$ to $\frac{11}{16}$ inch in diameter. The medium size will run about 3 to 4 feet, and will average $\frac{1}{2}$ to $\frac{5}{8}$ inch in diameter. The orchardist must remember that size, vigor, shape of roots, and the training of the top are all important, and mere height alone is not a safe guide.

planter should simply be sure that the nurseryman with whom he deals is a good, reliable business man. He should take the same precautions which he would in buying a barrel of sugar, a dairy cow, or a carload of fencing wire. The itinerant fruit agent should never be patronized, of course, except to get rid of him—never with the expectation of getting any useful trees.



(XX Size.)

(X Size.)

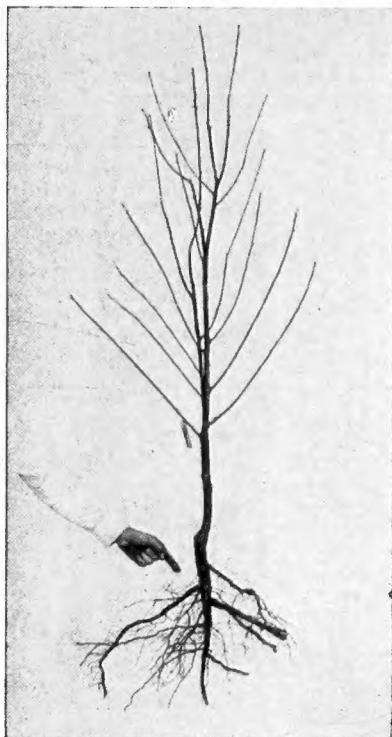
One-Year Apple Trees.

One-year-old apple trees are usually straight whips, as shown above, and should have plump, sound buds along the entire length, and the wood should be firm, sound and well matured. However, some varieties often have numerous branches on the lower half of the tree and many orchardists prefer such branched yearlings, as they combine many of the advantages of both the one and the two-year-old trees. Most planters prefer one-year stock because only thrifty trees are salable at one year; they can be headed at any desired height, and they stand transplanting better.

"The prices of nursery stock are so low, and the character of the goods furnished generally so high, that the orchard planter can hardly consider this one of his serious expenses. Above all other things, he should not practice a false economy in this part of the project. The best trees should be bought from the most reliable man in the market. A saving of \$2 or \$3 in the price of nursery stock may be lost a hundred times over before the first crop is gathered."

Nursery trees are sold by age, and the nurseryman must develop a certain sized tree within a specified time. It has been found that certain combinations of soil and climate in certain sections will produce better trees than can be grown elsewhere. A good orchard site is seldom a good place to grow nursery stock. The purpose of a good orchard location is to produce fruit, and the purpose of a good nursery site is to produce roots and tops. Fortunately, it doesn't make any difference in what part of the country a tree is grown, provided the above conditions prevail. If a tree has been properly developed, it will succeed in any other part of the country, so that every fruit-grower, even though he is not in a location where nursery stock can be grown satisfactorily, is able to get the best trees grown in the United States, wherever that may be.

The United States Department of Agriculture, in Farmers' Bulletin No. 631, "Growing Peaches," says: "Correspondents frequently write to the Department of Agriculture asking, 'Is it advisable to purchase



Peach Trees.

One-year peach trees are usually divided into three sizes: The XXX Size which is usually 4 to 6 feet tall and $9/16$ to $11/16$ inch and up in diameter. The XX Size, usually 4 to 5 feet tall and $7/16$ to $9/16$ inch in diameter; and the X Size, usually 2 to 4 feet tall and $3/8$ to $7/16$ inch in diameter. It is important that the tree should have heavy, strong roots and low head. If branches have all been pruned off of the lower 2 feet of the trunk in the nursery, it will be difficult to develop a low-headed tree. The wood should be firm and well matured and the trees should be allowed to stand in the nursery until they drop their leaves. It is not advisable to dig the peach trees from the nursery before the middle of October.

The roots are the most important part of a peach tree. The top is usually cut off 12 to 18 inches above the ground and side branches cut off about two inches from the trunk leaving a good sound bud on the underside of the end of the stub.

Peach trees from the nursery are generally one-year old; one-year tops and two-year roots as shown above.

trees from the South?" or "from the North?" or from some other section which the writer specifies. To such inquiries reply is habitually made to the effect that the section is unimportant so long as well-grown, healthy trees which are typical of the desired varieties are obtained, and that the growing of good trees depends upon favorable conditions and proper management in the nursery. These factors are not peculiar to any particular section or sections.

"The inherent qualities of a variety do not change when the trees are grown in different sections of the country. If the variety is hardy, it will continue to be so; if it is susceptible to some disease, it is not made less so by growing the tree during its nursery period in some particular region."

Professor F. C. Sears, M. S., Professor of Pomology, Massachusetts Agricultural College, states the matter very clearly in "Productive Orcharding;" "The argument of 'acclimated nursery stock' has certainly been overworked. Apparently the tree has the ability during the first growing season to entirely adapt itself to the new surroundings. But whatever the scientific explanation may be, the writer is thoroughly convinced of the fact that it makes little or no difference where the tree was grown so far as climatic conditions are concerned. What does make a difference is having good, thrifty stock." Prof. Sears is a practical orchardist, and he answers another very pointed question:

"What Price Shall We Pay?"

Enough to insure well-grown and well-packed stock. There is no economy in stock which is cheap in both price and quality. On the other hand, there is no use in paying the prices that are frequently asked. Of course, it is assumed that any man who



CHERRY TREES.

The above shows a one-year-old 3 to 5-foot cherry tree, with two-year-old roots. The one-year 3 to 5-foot is 11/16 inches and up in diameter. The experienced nurseryman can grow well-branched one-year cherry trees like this, of Dyehouse, Early Richmond, English Morello, Montmorency, Royal Duke, and Wragg. (The sweet varieties do not branch as well.) Experienced growers prefer the one-year branched cherry trees because the head can be given the ideal shape in the nursery, and very little, if any, pruning is necessary when they are set in the orchard. Further, there is a larger proportion of roots on these one-year trees than can be secured on the two-year-old trees. The one-year cherry trees are usually divided into three sizes: The XXX Size, which is 3 to 5 feet tall and 11/16 inch and up in diameter; the XX Size, which is 3 to 4 feet tall and 5/8 to 11/16 inch in diameter, and the X Size, which is 2 to 3 feet tall and 1/2 to 5/8 inch in diameter.

has ambition and sense enough to plant out a large orchard will have too much sense to buy his stock from a tree agent. Where one is buying only a half-dozen trees, he can perhaps stand the prices of these agents, but even then he can probably do better to buy direct from the firm."

Prices charged for nursery stock depend upon the number of trees which you buy, and for that reason it is advisable to place as much of your order as possible with one nurseryman. You can save money by going in with your neighbor and buying your trees together. Co-operative associations which buy trees in carload lots are able to get lower prices, because the trees are packed in bulk in the car and there is no expense for boxing. Very few nurserymen now make any extra charge for boxing and packing.

Location for Fruit-Growing

The location for fruit-growing must be reasonably free from late spring frosts. These occur most frequently in the small valleys. For that reason avoid planting in the lowland where cold air settles at night. The sides and tops of hills are the safest places. There are exceptions. There are many successful orchards in the bottom of the valleys, but in such cases there are usually winds which blow constantly and prevent frosting. Another exception is along the shores of lakes where the ground may be level, but adjacent bodies of water retain enough heat to prevent frosting. A large body of water sometimes prevents frosting eight or ten miles from shore. Some very good orchards are located along the Great Lakes on land that is very nearly level. Still another exception is

where the valley is very broad, so that the cold air can not accumulate in one place. Very fine apples are raised in the Shenandoah Valley of Virginia. However, the slopes of the mountains are considered better. Fruit may be grown high up in the mountains, but, as a general rule, fruit trees should not be planted at an elevation of over 5,000 feet above sea level, although there are successful orchards at 6,000 to 7,000 feet above sea level, usually protected by neighboring mountain ridges.

A good slope is not only less subject to frost injury, but the surface water drains off readily so that the slope has a "warmer," "sweeter" soil and produces fruit of high color and good quality. However, a field may have a good slope and still be poorly drained. Such an exception is where the subsoil is a very tight, impervious clay or shale, which does not let the water pass through it. On the other hand, some level lands are well drained, but they are nearly always porous, very sandy soils, or a porous loam, which allows the rain to soak through nearly as fast as it falls. Any land upon which water stands for any length of time is usually unfit for fruit-growing purposes. In irrigated regions all troubles with alkali soils are caused by poor drainage.

The importance of "exposure" has been greatly exaggerated. If a location has good air drainage and good water drainage, it is of no great importance whether it slopes north, south, east, or west. There are a few exceptions. It is sometimes important in the middle latitudes, where there is damage from spring frosts and sun-scald. South slopes will sometimes ripen the fruit a little earlier, and this is important in the case of the earliest-ripening varieties. Northern slopes are sometimes better where there is a great deal of injury from sun-scald. A gentle slope is to be preferred to a very steep one, and is less apt to wash. But the most important thing is to have a location that is free from spring frosts, and has good air and water drainage. To get this location fruit-growers often spend several times the original price of the land to clear it of stones and stumps, and to fit it for planting. They often plant on soil that is very poor and contains a great deal of rock, for these conditions can be remedied.



A good location must be: First, reasonably free from late spring frosts; second, the land should be naturally well drained, and, third, the soil deep enough to nourish the trees, and prevent them from being injured by summer drouths and severe winters. If the soil is fertile, so much the better. However, it is not necessary if you have the first three conditions, because fertilizers can be used to take care of the trees' immediate needs when they are set out, and the fertility of the entire soil built up later by cover crops and manuring.

It is true that some fruits seem to prefer certain kinds of soil, but the ideal soil for one kind of fruit is an ideal location for producing all other kinds. Soils may be divided roughly into clay, loam, and sandy soils, with any number of variations in between. The difference is due to the size of the little particles of earth. Clay is made of the smallest particles of earth, and when you rub it between your fingers you can not feel any grit. A sandy soil is made of fine sand, and you can feel the grit in it. A loam is half-way between sand and clay.

Clay Soil It should be plowed deep and harrowed thoroughly until in good condition for planting. It does not dry out as quickly as other soils, and is inclined to "bake;" therefore, there is less time for working it. Every opportunity should be taken to cultivate clay land, retaining the moisture as well as promoting the growth and preventing packing of the soil. Many an orchardist does not realize that he could prevent loss from nine-tenths of our drouths if he would only cultivate the ground thoroughly throughout the season.

Loamy Soil Loamy soil should also be plowed deep. It is usually fertile and does not require manuring as often as clay or sandy soil. Neither does it require as careful handling as clay soil. Trees are apt to grow late in the season on this type of soil; therefore cultivation should be stopped earlier than in other soils, so that the wood may mature well for winter.

Sandy Soil Sandy soil does not contain as much plant food, but responds quickly to fertilizers and cover crops, and under proper management produces highly colored fruit. If the tree does not make a new growth at the tip of the branch of at least a foot per season, it is a pretty sure sign that the land needs strengthening with manure and cover crops.

The amount of gravel or rock in soil makes little difference except it makes it inconvenient in cultivating and getting about the orchard. On steep hillsides rocks in the soil help to check washing. The finest Albemarle Pippins are produced on the Porter black loam in the coves of the Blue Ridge Mountains at about 1,800 feet elevation. This particular type of soil is very rocky and often very steep, but the Albemarles from these sections are better known on the European markets than any other variety grown in America. Rock or gravel in a soil tends to keep it open and porous, so the water drains through it readily; gravel soil is often a warm soil. The largest grape-growing district is on gravel land along the shores of Lake Erie. Poor drainage is more frequently caused by a tight, impervious soil. It is impossible to open or loosen up the subsoil except by dynamiting.

Preparation of Land The ground should be put in as good condition as possible before the trees are set, in order to insure the best growth. It is especially important to plow deep, because you will never be able to work the ground immediately under the trees again. On newly cleared timber land, and sod land, it is better to grow a cultivated crop for one year before the orchard is planted. Corn, potatoes, etc., are good. Cow peas and soy beans can be drilled in narrow rows and cultivated.

While it is better to have one year's preparation ahead of planting an orchard, it is not absolutely necessary. It will take a little extra work to set an orchard in a newly cleared piece of ground, but that is better than to lose a year's time. If manure is available, give the land a dressing, after the first plowing, worked in by a second plowing or by discing.

For fall planting, the ground should be plowed in the late summer; for spring planting, it should be plowed in the fall. This is especially true where the ground does not dry out soon enough for early spring plowing.

An exception to this is on steep hill lands, which are apt to wash badly. The usual rule is to plow as deep as possible. You can plow the ground an inch deeper than it has ever been plowed before, without injuring it. Where the subsoil is sandy or loamy, you can plow even deeper.

In the nursery work we have plowed 16 inches deep with a Spaulding deep tilling machine, bringing up 10 inches of subsoil that had never been plowed before, and it did not injure the field in any way. However, the subsoil was very much like the top soil, and the Spaulding machine mixes the top soil and the subsoil thoroughly, and does not leave a lot of the subsoil on top of the ground the way the ordinary turning plow does.

It is often advisable to plow again in the spring, as it improves the tilth of the soil. Discing sod land before plowing breaks up the lumps of sod and mixes them with the soil so they will rot quicker.

Avoid deep furrows, unless they are especially needed for surface drainage. This can be done, beginning with a line running through the center of the field, turning all furrows inward.

Alfalfa land should also be plowed twice before it is planted to trees. In the late summer it should be plowed about 2 inches deep with a plow which has a sharp share, which will cut the alfalfa just below the crown. The furrow should be turned over so that the crowns will be exposed to the sun and killed, avoiding sprouts and trouble later on.

After plowing, the ground should be very thoroughly worked with a disc harrow, and then gone over several times with either a spike-tooth or a spring-tooth harrow, so that all the clods will be broken up. Then smooth it over with a plank drag.

Raw land, in the arid sections of the West, should be leveled up before it is plowed, and, if it has never been irrigated, it should be thoroughly soaked, because land of this type often settles so that it is impossible to irrigate until it is leveled again.

In the East, it is often advisable to level new ground before it is plowed in order to get rid of the small holes in which water might stand.

Subsoiling is sometimes advisable on marly subsoils or where there is a hard pan. However, it is seldom necessary.

Dynamiting Dynamiting is also sometimes advisable where the subsoil is either stiff clay or contains a great deal of hard gravel which will not let the tree roots through. Dynamiting must never be done when the subsoil is wet, as it injures the soil in the same way as plowing injures a wet top soil.

Make a hole with a crowbar where the tree is to be set. The charge of dynamite should be put down deep enough to break up the subsoil, usually 3 to 4 feet. As a rule, half a stick of dynamite is sufficient.

It is not advisable to blow out a hole, but simply to break up the subsoil. A 25 per cent dynamite, which is slow-acting, is better than a quicker-acting dynamite used for blasting rocks.

If you have not had experience with handling dynamite, write the DuPont Powder Company, Wilmington, Delaware, and ask for their books.

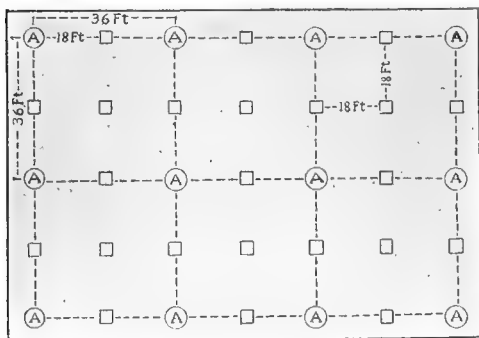
Caution: When setting trees in freshly dynamited holes, see that no "air-pockets" are left, as they will cause the roots of the tree to dry out. It is easy to locate such holes by shoving an iron bar into the ground.

Laying Off the Land The field should be laid off as soon as the ground has been prepared for planting. The tree rows should be straight. It not only looks better, but makes the care of the orchard easier. Once the trees are set, you can not straighten out the rows. If this is your first orchard, it is advisable to set a stake where every tree is to go, so that you can sight down each row and see that they are all straight and true.

There are two good plans for laying out an orchard. First, the square plan that is generally used, in which a tree stands at the corner of the square.

Second, the triangular plan, where the trees stand at the corners of a triangle, each being equally distant from the other trees around it. By this arrangement 15 per cent more trees can be set on an acre of ground than by the square method, and the ground can be worked in three different directions, which is often an advantage where irrigation is practiced.

Measuring Wire A wire should be used in measuring the ground, as it does not stretch. Wherever possible a surveyor's chain is used. A corn planter wire can be used to good advantage. Smooth fence wire can be used if the distances are marked on it. This can be done by patches of solder placed at the exact distance between the rows of trees or vines, or, if the wire is going to be used only a short time, the distance can be marked by filing a notch.

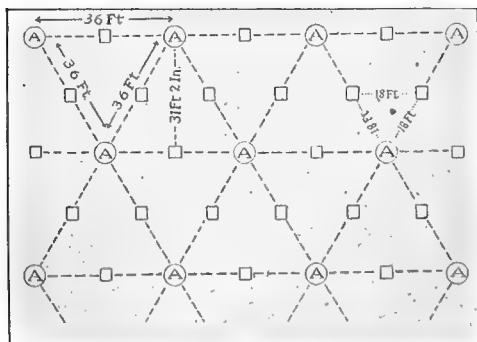


Square Planting Plan.

Square Plan.

This is the plan generally used. The permanent trees are set in the circles marked "A." The fillers can be set in the squares. When the permanent trees are set 36 feet apart, there will be 33 permanent trees to the acre, and 99 fillers. (There are just three times as many fillers as permanent trees.)

The tendency is toward greater distances; 40 to 60 ft. apart for some varieties, like Rhode Island Greening.



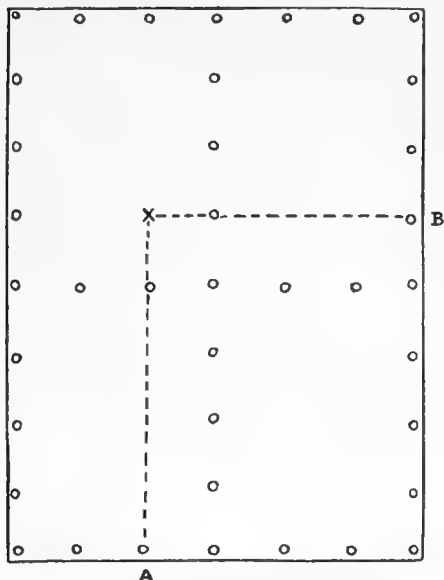
Triangular Planting Plan.

Triangular Plan.

Make a triangle of three boards about 1 inch thick and about 4 inches wide, of a length equal to the distance between the trees. These should be crossed at the ends so as to form a notch. Set the two corners of the triangle on the two stakes at the base line, and then, at the third corner, set a stake. Move the triangle over to the next stake until the second row has been laid out. Using each row as a base line, the entire field is staked.

Measure and Sight Method

This method is best adapted for general planting. It is easy and accurate. Lay off the four sides of the field. Measure the distances and locate the stakes that mark the ends of the rows all around the field. Then find the center of the base line of one end of the field and run a row of stakes from this point to the corresponding point in the opposite end of



Use of the Measure and Sight Method.

This diagram shows the field with stakes set around the four sides, and the two rows of stakes across the center. A man at "A" sights across the field and a man at "B" sights across the field. A tree is to be set at "X," where the two lines of sight cross. The location of the balance of the trees can easily be found by this method of sighting. Some growers set the stakes for the entire field. Others merely set the stakes as shown above, and then sight on the tree and plant without setting any stakes except those around the field and two rows across.

right spot. When this method is used, it is very often possible to dig the holes and set the trees without setting stakes.

Planting by Measure This is another very good method, reasonably cheap, and possibly the most accurate of all.

1. Lay off a base line, which should be along a line fence or along the road. It should be far enough from the road or the line fence to allow plenty of room in turning and in cultivating the outside of the row—20 or 25 feet is not too much for an apple orchard; less will do for a smaller-growing tree. Next, set a stake on this line in one corner of the field where the corner tree is to stand.

2. Set a range stake at the other end and the same distance from the road or line fence. These two stakes make the base line. Now begin at the stake No. 1 and set stakes along the base line toward stake No. 2, being careful to get the stakes the exact distance that you want between the trees.

3. When you have the stakes set in this base line across the field, begin at about the center of this line and lay off another line of stakes at right angles to the first, and set the stakes on this line in the same way that you set them in the base line.

the field. Set another row of stakes from the centers of the two remaining sides of the field, crossing the first row at right angles in the center of the field. These stakes should occupy places which the trees of these two central rows will fill. All these stakes should be reasonably tall, and if the ends are painted white it will be easier to see them. Ordinary plaster laths make good stakes.

After the stakes around the field and the two rows across it (one row each way) are in place it will not be necessary to do any more measuring, for the job can be finished by sighting through. Wherever a tree is to be located, it will be possible to sight on two stakes on the lines running up and down and two stakes on the lines running crosswise. A gang of three men can be used to good advantage—one man sights in one direction, another in the other direction, and the third man sets the stakes. He is waved into position by the two sighters where each stake is to be set, and every one goes into the

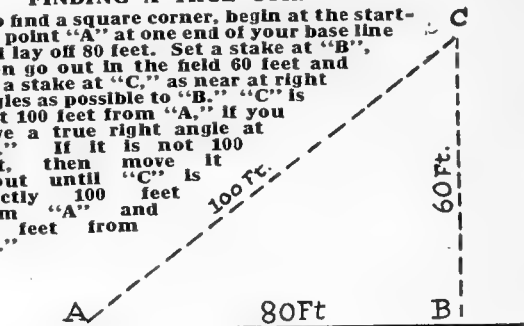
4. The rest of the stakes are set with two "measuring boards." The "measuring-boards" should be as long as the desired distance between the trees. Well-seasoned pine or redwood boards 1 inch thick and 3 inches wide will do for these boards. There should be a notch at the end of each board, and they can be somewhat more easily handled if the ends are fastened together with a small bolt.

5. The end of one of the measuring-boards is placed at one of the stakes on the base line. The end of the other measuring-board is placed at the stake on the line which is at right angles to the base line, then where the two ends of the measuring-boards meet is where the next stake should be set. In this way, a line of stakes is set clear across parallel to the base line, and the next parallel to it, and so on until the entire field is staked.

Where the trees are to be planted a long way apart, a wire triangle will be easier to handle than one made of boards. To make a triangle, use three pieces of wire and three harness rings, fasten the ends of the wires together with the three rings so as to form a triangle, with a ring at each corner. The distance between the rings should be equal to the distance between the trees.

FINDING A TRUE CORNER.

To find a square corner, begin at the starting point "A" at one end of your base line and lay off 80 feet. Set a stake at "B", then go out in the field 60 feet and set a stake at "C," as near at right angles as possible to "B." "C" is just 100 feet from "A." If you have a true right angle at "B." If it is not 100 feet, then move it about until "C" is exactly 100 feet from "A" and 60 feet from "B."



Set two of the rings over the stakes on the base line and allow the third to go out into the field. The three wires should be stretched tight, and where the third ring goes, set a stake. Move your ring down one stake on the base line, and set the next stake. In this way set a row of stakes parallel to the base line then move over on the second line and set a third, and so on until the entire field is staked off.

Rows on the Hillside

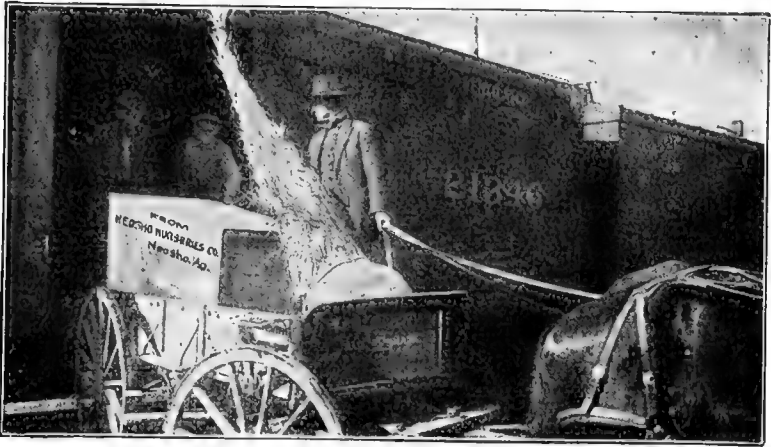
Where a hill is too steep to cultivate both ways, it is often an advantage to place the rows so they will run on the same level around the hill. It is easier to cultivate and spray. The exact distance between rows depends upon the steepness of the hill.

Marking with a Plow

This method is often used on small orchards where a slight variation is not so apparent as in the larger orchards. A good two-horse turning plow is rigged with a "marker"—a light wooden bar extending at right angles from the beam. On the end of this bar a cross-piece is fastened perpendicularly so it scratches along the surface of the ground. Stakes should be set for plowing out the first furrow.

When this is done, the team is turned back and sent back along the next row, the location of which has been fixed by the marker, and so on the length of the field, the marker being turned each time to indicate the next furrow.

Then the plow furrows across the field at right angle to the others, and the trees are planted at the intersection of the furrows.



Call for your trees promptly. The sooner they are in the ground the better.

Receipt of Trees

It is the duty of the nurseryman to deliver trees in perfect condition and the fruit-grower for his own interests should get them into the ground without any loss of vigor. Many growers who are pointed out as successful fruit men do not take the precautions they should. They are successful with their trees, they have grown orchards and make money, but they do not realize that it is possible to bring an orchard into bearing a year or possibly two years sooner by using a little extra care and getting the trees from the nursery to their orchard without any loss of vitality.

Call promptly for trees as soon as they arrive. Do not allow them to remain in the express office or freight office. In case there has been any delay in transit, have your local agent trace them and also notify the nursery to have them traced by wire. Examine the trees to see if they are in good shape. As a rule they are handled with special care by railroad employes, but if anything seems to be wrong, notify the nursery promptly. Some people will set out their trees and neglect them. Then, if the trees do not survive, they write to the nurserymen some months later that the trees did not reach them in good condition. If there is any doubt at all, report the condition at the time they are received, even though you think the trees will be right anyway. Most nurserymen are willing to make good any loss of this kind when they know there is a just cause for complaint.

If possible plant the trees immediately. The sooner they can be put in the ground the better. During a spell of cold weather the box or bundle can be put in a cool cellar or barn and covered with straw. One or two boards should be lifted from the top of the box and the stock examined to see if it is in good condition.

If the weather is warm when they arrive and you are not ready to plant, unpack immediately, and heel-in or place them in a cool cellar, covering the roots with damp packing from the box or bundle, and spread old sacks or canvas over them. Do not allow them to dry out. Sprinkle the package just enough to keep the trees from drying out, but do not put enough water on to drench the roots and tops. Remember that a tree is a living thing, and can be injured even though it is dormant at the time it is handled. Keep this in mind, and thus avoid trouble or loss.

Heeling in Trees

To heel-in trees, select a high, dry, well-drained location. Dig a trench $1\frac{1}{2}$ to 2 feet deep and wide enough to hold the roots of the trees without crowding. Throw the dirt from the trench on one side so it forms a bank. Lay the trees with the tops against this bank of dirt and the roots in the trench. Cut the string from the bundles and spread out the trees so you can fill dirt in all the spaces between the roots. Be careful to separate the varieties so you will not get them mixed. When the trench has been filled in this way, dig it wider, throwing the dirt over the first layer of trees until they are completely covered. Then put on another layer of trees in the same way and widen the trench still farther, covering them.

When the last layer of trees has been covered in the above manner, then throw on enough dirt to entirely cover the trees, forming a mound. Pat the dirt firmly down over the trees, so that the dirt will shed water. It is better to completely bury the trees in this way, although some growers leave the tops exposed. When the tops are exposed, there is danger of injury by rabbits or mice, and if the weather should turn very dry and cold after the trees are heeled-in, it will dry out the tops to a certain extent; or, if the weather should turn warmer, the buds are more apt to swell.

In the arid sections of the Western States and also in the East, if the ground is dry, bucketfuls of water should be poured on as the dirt is mounded about the trees.

In case the trees have dried out to any extent in shipping, they should be buried in wet dirt for one to three days, or they may be put in a pond or stream for one to three days, with the water covering them entirely. This freshening helps the trees a great deal. This suggestion is not given in defense of the nurserymen who willfully deliver the stock in a careless condition, but such cases will sometimes arise, and knowing how to prevent any injury will save both the grower and the nurseryman inconvenience and loss.

Pruning the Roots

Cut off all small dead fiber roots and any bruised or broken roots with a smooth cut; be especially careful to cut out the small fibrous rootlets and the rough ends of the large roots.

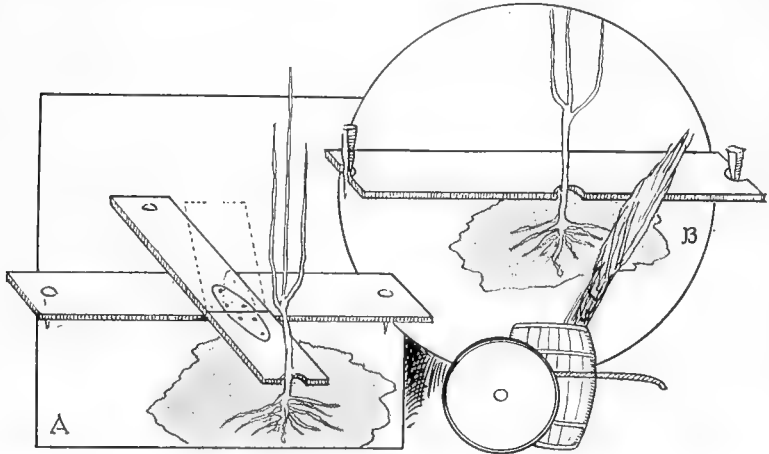


Before and After Pruning the Roots.

Remove all of the small thread-like roots. This is especially important in the case of apple trees that are to be planted in certain sections of the Southwest where they have more or less trouble from root rot. It has been thoroughly demonstrated by Professor J. C. Whitten, formerly of the Missouri Experimental Station, that if the roots of apple trees are pruned right, they can be satisfactorily planted where an old tree has died from root rot.

The rot gets into the sound roots through the small dead rootlets or injured roots. That is why they should be cut away clean.

The roots of different classes of trees vary, but they are pruned in very much the same way.



The trees are often carried in a barrel on a cart. There are several inches of water in the barrel to keep the roots from drying out. If many trees are to be planted, several barrels can be carried in an ordinary farm wagon.

The Planting Board

Where a stake is set for each tree, a planting board is necessary. Above are illustrated two ways of making a planting board. "A" is made in the form of a cross, of 1x6 inch lumber, the longer board being four feet long, the shorter 3 feet. Note that one of the shorter ends is hinged and notched. In using this board, place the "notch" around your stake, press the spikes which are in the other three ends firmly into the ground; then turn the hinged part of the board back and dig the hole. When ready to set the tree, simply fold the hinged part back into the original position and set the tree in the notch. With board "B" it is necessary to drive a stake for each end of this board (it is 6 inches wide and 4 feet long); set the notch about the tree stake, place the end stakes or pegs, then remove the board until the hole is dug, after which replace the board and set the tree as explained with reference to "A." In using either "A" or "B," care should be used to hold the tree in proper position until the dirt is firmly placed about the roots.

Protect the Roots

When the trees are taken out into the field, protect the roots from exposure. A half-hour of hot sunshine on the roots of a tree may kill it. Cover them with wet sacks or packing out of the box in which they came. Another good plan is to fill a tank about one-fourth full of water and put the trees in the tank. When the weather is hot and the buds swollen you should be especially careful not to get any water on the enlarged buds as it might injure them.

Digging the Holes and Setting the Trees

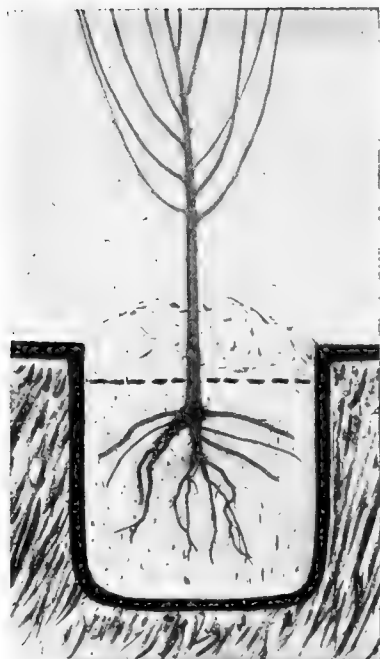
The tree should be set in the orchard at about the same depth that it stood in the nursery. In very sandy soils that are inclined to dry out quickly, they should be set from 2 to 4 inches deeper, depending on the size of the trees. Trees set in the fall may be set several inches deeper than spring-set trees. Another exception is dwarf pear, which should be planted deeper than it stood in the nursery. Dwarf pears are budded on quince roots in order to make them dwarfish-growing trees. The union is not as strong on these dwarf trees as on standard pears budded on pear roots, and so, to prevent the tree from blowing over after it grows two or three years, the swelling where the pear is joined on to the quince root should come 2 or 3 inches below the surface of the ground. Do not set the tree any deeper than this; if you do, roots will develop on the pear wood, and as soon as the pear develops roots of its own it is not dependent on the quince roots and ceases to be a dwarf.

The holes for the trees should be large enough to take all the roots in their natural position. A common practice is to plow furrows across the orchard in both directions, so the furrows cross wherever a tree is to be set. This does not make the holes deep enough, but they can be enlarged with a spade. Others plow just one way and mark the places where the trees are to go along the furrows.

Where there are strong prevailing winds that always come from the same direction, some orchardists lean their trees slightly in that direction when they plant. Others lean them towards the southwest so as to shade the trunks of the trees from the afternoon sun, which is an advantage in the Central and Southern States. The trees can be set straight and the same results obtained by the following method. No matter how straight or symmetrical a tree is, it will always be heavier on one side than on the other, so that the pith of the tree is not up the center of the trunk, but rather to one side. Balance the tree on your hand and the heavy side of the tree will naturally roll toward the ground. This side should be planted towards the southwest, or the prevailing winds. The tree will then bend very easily towards the southwest or the prevailing winds. Planting this side towards the southwest enables the tree to stand up much better against the wind and the blistering sunlight.

The tree should be held in place while the dirt is being filled in around the roots. It is an advantage to fill in the holes with the rich top soil. Don't dump a big shovelful of dirt in on top of the roots so that all the roots are squeezed together in the bottom of the hole, but hold the shovel high and shake off a little of the dirt at a time, so it sifts in about the roots. In this way, the roots take their natural position and are surrounded by fine dirt. Work the dirt in about the roots of the tree and move the tree slightly, so as to settle the soil without leaving any air-pockets. Press the dirt firmly about the roots.

The roots will grow better where the dirt has been packed down good and firm. Don't dump all the dirt in the hole and then try to pack it; for



Dig holes large enough so that the roots can be placed in their natural position. Set the tree about as deep as it stood in the nursery. Press the dirt firmly about the roots until the roots are covered. Then fill in three or four inches of loose dirt, mounding up around the tree. Do not pack down the last several inches.

while that will make it tight near the top, it leaves air-holes down in bottom. Don't pound the dirt as you would when setting a post, but try to leave it as firm as the ground was before the hole was dug.

When the roots are well covered, but before the hole is entirely full, add only enough water to thoroughly moisten the dirt. Too much water is likely to cause injury if the ground is at all dry. Then put in the rest of the dirt and mound it up about the trees 3 or 4 inches high. Do not press down the last several inches of dirt.

Remove Wire Labels

Remove all of the wire labels from the trees as soon as they are planted. Do not leave these twisted tightly about the tree, for they will cut the tree and cause serious injury as the tree grows larger.

To make a good permanent label, get sheet zinc and cut it in strips about $\frac{5}{8}$ inch wide and 5 inches long, and scratch the name of the variety on the strip of zinc with the end of a file or some other sharp tool, and wrap this about one of the smaller limbs.

Number of Trees or Shrubs Required to Set 1 Acre

1x3 2-3 ft.	11,880	6x 6 ft.	1,210	20x20 ft.	108
2x3 2-3 ft.	5,940	6x 8 ft.	907	20x30 ft.	72
2x5 ft.	4,356	8x 8 ft.	680	24x24 ft.	75
3x3 ft.	4,840	8x10 ft.	544	25x25 ft.	69
3x6 ft.	2,420	10x10 ft.	435	30x30 ft.	49
3x8 ft.	1,815	10x12 ft.	363	32x32 ft.	42
4x4 ft.	2,722	12x12 ft.	302	34x34 ft.	37
4x6 ft.	1,185	12x16 ft.	226	36x36 ft.	33
5x5 ft.	1,742	16x16 ft.	170	38x38 ft.	30
5x8 ft.	1,089	18x18 ft.	134	40x40 ft.	27

To determine the number of trees per acre for any given distance, multiply the distance between the trees in the row by the width of the row. Take the resulting answer and divide 43,560 by it. The resulting figures will give you the number of trees per acre. For example: To determine the number of trees, planted 30x30, required to set one acre: $30 \times 30 = 900$; $43,560 \div 900 = 49$ trees per acre.

The location of the orchard must be right, for there is no way to change it once the trees are set. The depth of the soil should be right.

The soil can be loosened up by dynamiting so that the trees can go farther down than they could naturally, but there is no way to overcome the disadvantage of a soil that is very shallow.

It is an advantage to have a soil that is naturally fertile, but other things are much more important.

Fertility is the one thing that can be built up—hence, it is always the last to be given consideration. An orchard can be planted on very poor land without losing time to build up the fertility.

For this purpose organic fertilizers, like sheep guano, which is a complete fertilizer, or a complete fertilizer from the packing houses, which does not contain chemicals, can be used. It does not take a great deal to supply the requirements of the trees for the first year or two. In the meantime, the entire field can be built up by proper rotation of cover crops and use of fertilizers; so, as the orchard grows, the soil can be enriched.

Fertilizers Many fruit growers make a good profit by using nothing but complete commercial fertilizers, but this is not the most economical or satisfactory plan. There are cheaper and better ways to do it. Fruit-growers as well as farmers of this country have not paid enough attention to the fertility of their soil. They are too much like the old pioneer who had been robbing new land of its stored-up fertility. He was invited to hear a lecture on "Soil Improvement," and he replied: "I don't want to hear any lecture like that—I know all there is to know about it because I have already worn out three farms, and they can't tell me anything."

In the European countries, the people have been forced not only to maintain the fertility of their soil, but to improve it, because land there has been scarce. Land is getting scarcer every year in this country, so that the successful man will be the one who can not only keep up the fertility of the soil, but make it richer at the least possible expense.

Complete commercial fertilizers are all right as a makeshift, but they are too expensive in the long run.

Cover Crops To keep the fertility of the soil and to improve the fertility of run-down land, there should be a system of cover crops, such as cow peas, soy beans, clover, vetch, and in some instances alfalfa. These will build up the soil. They add humus, which is partly decayed plant matter.

A soil that is rich in humus looks dark and fertile—one that has little humus looks thin and poor. Humus has many beneficial effects on the soil; it is so necessary that you might add any quantity of chemical fertilizers to the soil, but if you do not keep up the supply of humus, the land will get in such bad shape that it will not produce crops.

The cover crops add nitrogen, the most expensive kind of fertilizer that you have to buy. The cover crops take nitrogen from the air.

There are ten elements that are necessary in the soil, but, as a rule all except three are present in the soil. These three are nitrogen, phosphate and potash. It often happens that where these three seem to be lacking there are really plenty of them locked up in the soil, but in such a form that the trees can not use them.

Here is where the humus is especially helpful, because the cover crops take these elements that are in the soil and work them over and leave them in a form that the trees can use.

However, these elements are sometimes actually lacking in the soil. They may not be there in any form, and, to get the best results, they should be added. Nearly all soils can be benefited by the addition of nitrogen, and cover crops are the best way to add this element to the soil.



Cover Crop in a Michigan Cherry Orchard.

Phosphorus (phosphate) matter can be added in the form of bone meal, which contains 20 per cent of phosphorus and 3 per cent nitrogen. However, bone meal is expensive, and most growers will find rock phosphate cheapest. This is a form of rock that is mined in Tennessee and Florida. Ground as fine as flour and applied to the soil, it is the most economical; but when it is used there must be humus in the soil. Humus makes the rock phosphate soluble, so the tree roots can absorb it.

Where immediate results are needed, or if the soil lacks humus, the acid phosphate should be used. The difference is that it has been treated with acid to make it soluble. It is quicker acting.

Potash is known as Muriate of Potash and contains about 50 per cent potash. There is another form, known as Kainit, that contains only 12 per cent of potash, but you have to pay freight on the 88 per cent of other matter, which makes it really more expensive in the end.

Complete commercial fertilizers are not to be recommended for general use, because a soil may be lacking in nitrogen and phosphate and still have plenty of potash, or it may be lacking in potash and phosphate and have plenty of nitrogen. In any case it would not pay to put on a complete commercial fertilizer that contains all these elements when all the soil needed was one or two elements. There is just one way to find out what your soil really needs, and that is to buy a fertilizer containing nothing but potash and put it on the ground with some crop. If your soil needs potash, the crop will show a great improvement. If it does not need potash, it will not show an improvement. Test out with acid phosphate the same way.

In our own testing we apply Muriate of Potash, at the rate of 50, 100 and 200 pounds to the acre. We drill in a strip about 100 feet long, testing it at the rate of 50 pounds to the acre; then we set the drill over to 100 pounds to the acre, and drill in another strip.

In testing the ground for phosphate, we use the acid phosphate, because it gives quickest results, and we can test it on peas, rye, or any other annual crop. We use it at the rate of 300, 600 and 900 pounds to the acre. In each case we always drill in a strip without any fertilizer to serve as a comparison with the ones that have been fertilized.

Anybody can make a test like the above and determine just what fertilizers the land needs. Then you can buy the phosphate and potash, and mix them in just the proportion that your soil needs.

The only complete fertilizer that you can afford to use is barnyard manure. Good manure of this kind sells anywhere from 50 cents to \$2.50 per ton in different parts of the country, and it is well worth the price. It should be spread evenly at the rate of 5 to 10 tons to the acre.

Liming It is often necessary to add lime to the soil. Lime is not a necessary element to the plant, but the soil is very complex, and must not only contain certain elements, but must be in certain shape before the trees will thrive. A sour soil is one lacking in lime. Lime not only sweetens the soil, but it improves the condition and helps to make it more like a loam, so that it will hold moisture better and be easier to cultivate.

Lime can be added in two ways, either as burnt lime or as ground limestone. Burnt lime should not be used on thin, sandy soil, as it tends to burn out the humus. On such soil it is better to use finely ground limestone. It is cheaper, and you can use 1,000 to 3,000 pounds to the acre without hurting your soil.

Quicklime is used at the rate of 500 to 2,000 pounds to the acre.

Wood ashes contain about 40 per cent lime. They also contain 1 to 2 per cent of phosphorus. Wood ashes are rich in potash, having 5 to 6 per cent of this element. However, if they are exposed to rain, most of the potash will "leach" out. Coal ashes are of no value.

Nitrate of Soda Remarkable results have been obtained on poor soils in many commercial apple-growing districts with nitrate of soda. Greater production and increased vigor are quickly apparent. About four pounds per tree are scattered broadcast on the ground halfway from the trunk to the ends of the branches, and sometimes the same distance beyond the branches. Some apply the nitrate when the blossoms are showing pink, and others in February or March. Write to your State Agricultural Experiment Station.

Pruning

General Principles There are certain general principles which should be kept in mind in pruning fruit trees and vines, whether it be apple trees, peach trees, plums, or grape vines. Pruning, as a whole, is the means of adapting the tree or vine and its individual branches to the conditions about it.

In pruning we take advantage of certain habits of the tree and shape to produce a larger quantity of high quality fruit, when, if left to itself, the tree would produce inferior fruit.

In a damp, moist climate, such as is found along the Atlantic Coast and near the Great Lakes, apple trees are generally pruned with open heads to let in as much sunlight as possible.

In a clear, hot climate, like California, Arizona, and the Southern States, the heads of the trees are thicker and the branches are covered, so that the shade will afford some protection for the branches and trunk against the hot sunlight. In a hot climate the fruit will color up in the center of the tree, even where it is more or less shaded.

All fruit trees should be pruned with medium or low heads. Low-headed trees are easier to care for and the fruit can be picked at less expense. This is especially true of peaches.

Many of the large peach-growers train their trees so as to have all the branches within 12 inches of the ground, and they force the tops to spread out, so most of the fruit can be picked without the aid of a ladder.

Peach trees are also pruned each year to reduce the amount of bearing wood. In this way there is not much fruit that has to be thinned out later on.

The first fruit growers did very little pruning; then they found that by thinning out their trees somewhat they were able to get more fruit of better quality; then they went to pruning very heavily and went to the extreme. Now, both in the East and in the West, the growers are doing less pruning. They take the tree when it is young and shape it the way



One-Year Apple Trees in Nursery.

Some varieties are usually straight whips but others like the Jonathan almost invariably form branched tops. With the whips all the pruning required is to cut off the top at the desired height. With the varieties that branch they may be pruned as if they were whips or the same as the two-year as described on page 32.

In pruning, cut all branches off close to the main limb. Never leave a stub. The stub will never heal; but, if the branch is cut close, the tree will cover the wound with new growth in a short time.

Paint all wounds over $\frac{3}{4}$ inch in diameter with a wax of thick white lead and raw linseed oil paint.

Dead or diseased branches should be cut out.

Before pruning the tree at planting-time you should have in mind a certain style which you are going to follow. Choose the one that you like and follow that method, and you will succeed. Two men growing fruit under exactly the same conditions may follow different methods and both succeed.

See special chapter under Apples, Peaches, etc., for the different habits of growth of each kind of tree and the special directions for pruning them.

Some Reasons Why Trees Do Not Bear

Pollination Many varieties of apple, pear, plum, etc., are more or less self-sterile. A variety that is self-sterile is one whose pollen does not fertilize its own blossom. The yellow pollen dust of other blossoms is necessary in order to make it set fruit. If a blossom of a self-sterile variety were protected from wind and insects by a paper bag so that no pollen from another variety could get to it, it would fail to develop. While a variety may be absolutely self-sterile, its pollen is all

it should go and train it so it will not be necessary to prune it so heavily. If you get the tree the right shape to begin with, you will not have to cut it so heavily later on.

It is only a very few years since everyone advised cutting back one-half to one-third of the new growth of the trees for the first few years. Now the best growers are not cutting their trees back so heavily. They are allowing more of the wood to remain, and in this way they bring the trees into bearing younger. As soon as the trees come into bearing the strength of the tree is given to producing fruit rather than wood.

Time to Prune can be done anytime during the winter after the leaves fall and before the sap starts in the spring, except in the arid section of the West and in the extreme North, where the pruning should be done very late in the winter or early spring. Do not prune when the wood is frozen, as the wounds will not heal as well.

right for fertilizing the blossoms of another variety. Two such self-sterile varieties may be planted together; if dependent on their own pollen, they would not set any fruit, but by the interchanging of pollen both produce.

Comparatively few varieties are known to be absolutely self-sterile, but there are a great many which have a tendency towards self-sterility. Others are usually self-fertile. Both classes vary with external conditions. For example, the Kieffer pear is self-fertile in the South, and self-sterile in the North. In some cases Nature makes self-pollination impossible by the ripening of the pollen of the blossom before the ovary is mature and ready to receive it. Cross-pollination makes large and most uniform fruit. It has been found by practical experience that some combinations of pollen are especially good. Examples are: In plum: Green Gage with Italian Prune, Wild Goose with DeSoto; Burbank with Red June; in pear, Kieffer with Garber.

Generally speaking, any variety which is prolific, the blossoms of which are supplied with lots of pollen, makes a very good pollenizer if it comes in bloom at the same time as varieties which are weak in pollen. Most of the benefit comes in abundance and vigor. The pollen seldom has any direct effect upon the quality of the fruit.

Such varieties as Bartlett and Clapp will produce larger and most uniform fruit when fertilized with some of their own pollen.

Other Causes. A tree weakened in vitality through lack of cultivation has a tendency to become self-sterile, and if it grows still weaker, the blossoms may fail to set fruit even with fresh pollen from another variety. This is very often the case, and the soil should be constantly enriched by a system of cover crops and manuring. On the other hand, a tree growing too vigorously may have blossoms, but fail to set fruit. However, this is seldom the case. When it occurs, it is in young orchards which are longer than necessary coming into bearing. The growth may be checked by allowing the orchard to remain in sod for a year.

Bees. The importance of such insects as bees can not be too strongly emphasized. In many regions there are sufficient honey-bees and bumble-bees to produce thorough cross-pollination, but in large orchards or sections where there are many orchards every grower should keep one or more stands of bees.



Crown Gall and Hairy Root of the Apple.

Trees that are not healthy are not vigorous. Care should be taken to buy only sound trees, free from injurious insects and diseases. The above shows Crown Gall and Hairy Root, which are two forms of the same disease, which live in the tissues of the roots, either causing Crown Gall or peculiar bunches of roots, which are enlarged and fleshy, and easily distinguished from the sound, fibrous roots.

Other Insects. Very little pollination is due to the wind. Most of it is carried by insects, and in order to secure thorough pollination alternate varieties of the same kinds of fruits should be planted every third or fourth row.

Blossom Injury. Trees are sometimes supposed to be self-sterile when the lack of fruitfulness is really due to some other cause. Blossoms may appear perfectly normal, but on close examination it will be seen that the vital parts have been injured by frosts; a drying wind will sometimes damage them to such an extent that proper fecundation is prevented.

Rapid Growth. Where the growth is too rapid, trees often fail to form fruit buds. To make trees bear when tardy coming into fruiting, in June, when sap is in its highest flow, take out strips of bark from 1 to 2 inches wide, pointed at the ends, extending from the ground almost to branches. Always leave intact, around entire trunk of tree, alternating strips of bark about the width of the strips taken off. New bark will form quickly, without injury to the tree, yet a check will be given that will cause formation of bloom buds. This plan is safer than root-pruning or girdling.

Another method is summer pruning, when the trees are in full leaf.



J. H. Hale Peach Fillers in Baldwin Apple Orchard.

The above shows the late Mr. J. H. Hale in one of his orchards at South Glastonbury, Conn. On the right side of the picture is an apple tree loaded with prime Baldwins; on the left a "J. H. Hale" peach tree "filler." Mr. Hale believed in making his orchards pay the greatest possible returns right from the start. This method of planting peach fillers between the permanent apple trees is described on page 27.

Fillers

Fillers and intercrops are used in young orchards to get returns from the ground before the permanent trees come into bearing. (Do not confuse them with cover crops, which are used in old as well as young orchards to improve the soil. See page 21.)

A young orchard is an expense before it comes into bearing, and even after it comes into bearing there is a strip of ground between the rows that will not be used by the young trees for some years. Many successful fruit-growers plant early-bearing trees, small fruits, and other crops between the rows, not only to get full use of the ground, but to make these crops pay a profit over and above the cost of developing the permanent orchard.

George T. Powell, well known to New York and Eastern fruit-growers, has taken our money-making crops of fruit from the same grounds. He says:

"I have made \$340 an acre at Orchard Farm, Ghent, N. Y., from four crops of fruit on the same ground. The apple trees, planted 40 feet apart, were not in bearing. Between them peaches were interplanted 20 feet apart, currants 5 feet apart, and strawberries in between. The currants paid \$75 to \$100 an acre, peaches \$140, and strawberries \$100."

Mr. E. N. Plank, President of the Arkansas State Horticultural Society, says:

"I set apple trees 32 feet apart each way. Between these, one way, I set peach trees and four-year-old peach trees have averaged over \$1.00 per tree. Having 44 trees to the acre, orchard returns of \$44 per acre are very acceptable, three to four years after you have set out your orchard. I have also set strawberries, blackberries, and raspberries between the rows of fruit trees, and one year after the orchard was set I have received sufficient returns to pay for the land, fruit trees, and the cost of putting out and cultivating the strawberries."

Many orchardists find blackberries too hard to get rid of when it is time to take them out.

Prof. C. I. Lewis, Oregon Experiment Station, Corvallis, Oregon, says:

"Where irrigation is practiced, probably one of the most successful crops grown among trees in the Northwest is the strawberry.

"We do believe that the best opportunity to diversify the apple ranch—especially where the lands are high-priced and where there is an overhead cost, taxes, and interest on the investment, of from \$30 to \$50 an acre—is by the growing of more than one kind of fruit, and with alfalfa or clover, which should be fed to live stock on the ranch. We doubt very much if there are many types of farming other than fruit-growing, that will pay as good a dividend on an investment of over \$500 an acre."

In an apple orchard, fillers may be varieties of apple that come into bearing very young (third or fourth year): Yellow Transparent, Duchess, Wealthy, Wagener, also Jonathan, Grimes Golden, and Black Ben. Where these apples are used as fillers, they are in the center of the squares, so there are just as many fillers as there are permanent trees. Sour cherry trees make profitable fillers. They are upright growing, young bearing and adaptable to a wide range of soil and climate. Peaches are very generally used as fillers. They are set at equal distance between the permanent apple trees. If the apples are set 36 feet apart, the peach trees are set 18 feet apart each way, which gives you three times as many peach trees to the acre as there are permanent apple trees. Mr. Hale has used this

method very successfully, and his peaches have paid him large profits over and above all expenses before the apples came into bearing. (See illustration, page 26.)

Intercrops Both fillers and intercrops can be grown in the orchard. Strawberries are one of the best intercrops. Prof. Albert E. Wilkinson, New York State College of Agriculture at Cornell University, in his helpful book, "Modern Strawberry-Growing," says:

"The strawberry is a fine plant to use at the time of setting out a young orchard. Strawberries can be planted between the rows of trees and thereby give returns to the grower long before the trees could possibly produce any. The strawberry is considered by some people to be the very best crop for interplanting in an orchard for the following reasons:

- "1. It does not rob the trees of plant food.
- "2. It does not rob the trees of sunlight.
- "3. It requires good cultivation; the trees are benefited through working of the land.
- "4. It requires fertilizing or manuring.
- "5. Strawberries require some attention. At the same time the grower becomes acquainted with the trees."

If the everbearing strawberries are used, a moderate crop can be picked the first season after planting. Rows of currants and gooseberries are especially good grown as an intercrop. Black raspberries are also satisfactory. Asparagus and rhubarb can be grown in the same way. All of the above are especially good, for they will bring moderate returns the second season, and there is very little extra expense because the permanent trees get full benefit from the cultivation and fertilizers used on the intercrops.

The general farmer who is also developing an orchard can often raise such crops as cabbage and mangels, which he can feed to his live stock. Garden truck and early potatoes can also be grown between the rows, but no crop must be sown that requires late cultivation, or requires digging the last part of the summer, as cultivation at this time will stimulate the growth of the young trees so they may suffer from winter injury. Corn is also used, especially in the Northeast, where they raise the Flint corn; Flint corn does not shade the trees as much as the Dent corn. The rows of corn should not be within 4 to 8 feet of the tree, for the trees should have good cultivation.

Never plant grain, hay or any other uncultivated crops in the young orchard. They are not good at any time, and especially bad in a young



Intercropping—Strawberries Planted in the Orchard Rows.

orchard, which must be thoroughly cultivated. Edible varieties of beans and peas are good crops, because they not only pay a profit, but improve the soil. It is evident that, where any crops are used, the ground should have some fertilizer. Always put back into the soil as much or more than you take out of it.



This shows a well-trained Baldwin apple tree in the late Mr. J. H. Hale's orchards at South Glastonbury, Conn. Note the low, open, spreading top. All of the fruit is perfect and highly colored. Plenty of room for sunshine and circulation of air in the center of the tree. A great deal of the fruit can be reached from the ground. Also note the large granite rocks in the foreground. This orchard is on top of the hills overlooking the Connecticut River Valley, where there is good air, drainage and freedom from late spring frosts. A great deal of work and expense were necessary to remove the largest boulders and fit this ground for planting, but it paid to make the soil right, because the location was ideal in every other respect.

Apple Trees

Special Directions for Pruning and Care.

The cultivated varieties of apples, like all our other fruits, came originally from trees which grew wild in the forests. They have been improved by centuries of selection and cultivation, but they still retain a great many characteristics of the wild trees. Pruning is necessary in order to train them to grow just the way we want them. They do not have the thorns like the wild trees, but if left to themselves, they will grow dense, bushy tops, and produce small apples. We change their habits for the convenience of the grower in picking, to give the tree greater strength, to make the branches stronger so they will bear heavier loads, to produce larger fruit, and to bear regular crops.

A definite plan of pruning should be decided on when the trees are set out. Prune them at planting-time to conform to the shape decided upon. During the next three years prune them to develop that shape. After this it will not be necessary to do a great deal of pruning if they have been started right.



(1) The pruning of a two-year-old apple tree from the nursery and a one-year-old apple tree, after one season's growth in the orchard, is the same. Both trees before pruning are similar to Figure 1.

(2) This shows the tree in Figure 1 after pruning.

(3) This shows Figure 2, looking down on it from above. Note the branches all point in different directions, but these branches are located some distance apart along the trunk of the tree.

Some pruning is necessary each winter to maintain the desired shape. Dead or weak branches should be removed.

Trees are generally shaped one of two ways:

First, the pyramid-shaped tree, with a main trunk growing up through the center of the tree to the top and many small branches growing from it, like a Christmas tree. This is not to be generally recommended.

Second, the vase-shaped tree. This is the shape preferred by most planters. It has a central trunk, 20 to 40 inches tall, depending on whether the medium or low-headed tree is preferred.

Three to five branches are located along the upper 14 to 16 inches of this trunk. The branches are all about the same size and there is no central leader.

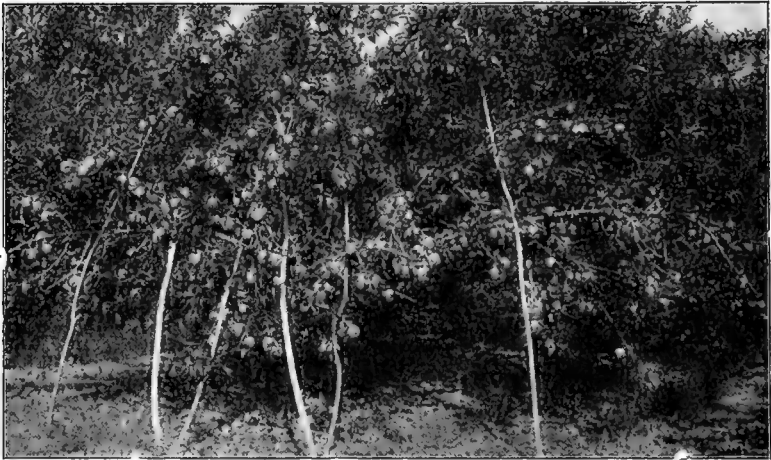
The shape of the tree is not spoiled in case there is an accident to any one of the branches. It is easier to prune, spray, and gather the fruit on a vase-shaped tree.

The vase-shaped tree has the greatest amount of bearing surface, and at the same time can be kept open to the sunlight and air. It is so superior that it is the only method of training we will describe.

It is better to do a little pruning each year; otherwise it becomes necessary to cut out an extra amount of wood, and this in turn stimulates a growth of water-sprouts and upsets the balance of the tree.

In an orchard that has been neglected for some time, it is often necessary to prune very heavily, and it takes a year or two to get the tree back to its normal balance again, where it will produce a full crop of fruit and make a good, vigorous growth without developing a lot of water-sprouts.

For general directions on pruning, see page 23.



Delicious apple tree showing wonderful productiveness. This Washington orchard began bearing the third year and when nine years old averaged five barrels per tree. They sold for \$6.00 to \$7.50 per barrel.

High and Low Headed Trees All the foremost growers East and West prefer medium or low-headed trees. Very few grow apple trees with the tops 5 feet or more above the ground as was the case years ago in some sections of the East. However, the growers in the East and North, where the climate is cold and moist, find it advisable to train their trees with a medium head.

The main trunk of the tree is 30 to 40 inches tall. The branches are distributed along the upper 14 to 16 inches of this main trunk, which brings the lowest branches within 14 to 26 inches above the ground.

The advantages of the medium and low-headed trees are: It costs less to spray, prune, and pick fruit from low-headed trees; there is less trunk exposed to injury and the diseases. Low-headed trees are less apt to be blown over and injured by severe wind. There is less danger from sun-scald, which occurs more frequently in the South and West.

In the Northern sections, where big snow-drifts form to the depth of several feet, it is advisable to head the trees high enough to prevent breaking of the branches from the weight of the snow.

Trimming the Roots at Planting. See page 17.

Pruning One-Year Trees at Planting Time. The one-year apple tree is usually a straight whip, without branches. The only pruning necessary is to cut it off at the desired distance above the ground. In some cases the nurseryman can furnish an extra heavy one-year tree with branches on it, which should be pruned the same as the two-year tree. These one-year-old branched trees have branches near the ground, and should be used where an extreme low-headed orchard is desired.

In training the side branches, always select a bud that is pointed in the direction you want the branch to go. By cutting to buds on the under side of the branch, an upright-growing tree may be made to spread out. By cutting to buds on the inside of the tree, drooping trees may be made to grow more erect.

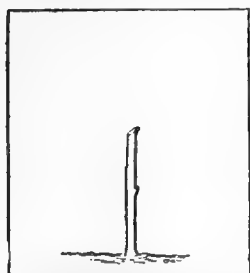
Pruning the Summer After Planting. A great many authorities recommend rubbing off the leaves on the lower part of the trunk of the tree where no branches are desired, the argument being that it is cheaper to rub them off when they are young and tender than it is to cut them

off with a knife at the end of the growing season. However, our experience has shown that it is best to let all the leaves grow during the first season. The tree is given a severe shock when it is transplanted, and the more leaves it has the sooner it will establish itself in its new place.

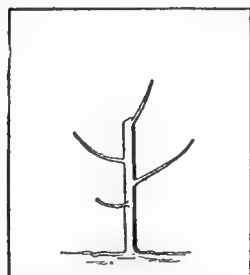
Experience in the nursery and in orchard planting shows that the more leaves the trees put out the better the growth will be, and that it is better to let the tree make all the growth it can the first summer without trying to prune it into shape. This point was demonstrated by Herbert Chase of Delta, Colorado, who says:

"Any leaves that are removed from the trunk of a newly planted tree weaken that tree. The idea of rubbing the leaves off to throw strength to the upper branches is wrong, for that tree has no strength to throw anywhere.

"All the strength that the tree has is what Nature stored in its body when it stood in the nursery row. If you rub the leaves off, it may not kill the tree, but if the leaves are left on, more trees will live, and they will make sturdier, stronger growth."



(1) Pruning one-year tree at planting.



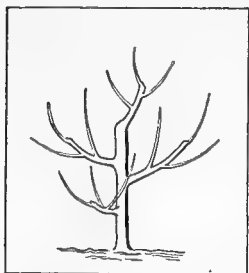
(2) The way that a two-year-old tree from the nursery or a one-year-old tree that has made one season's growth in the orchard should appear after pruning.

Mr. Chase made a number of experiments on different kinds of soil and under different conditions. The same kind of trees were used in each case. Half of them had the leaves rubbed off the lower part of the body, and half did not. They received the same attention, and in every case the trees that were not rubbed made the strongest, heaviest growth.

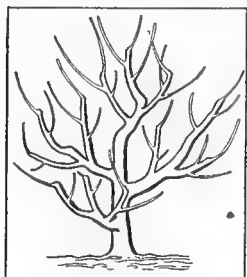
Pruning the First Season's Growth After Planting. The pruning of a two-year-old tree from the nursery and the pruning of a one-year-old tree that has grown in the orchard for a season are practically the same. Where the orchardist plants a two-year-old nursery tree, he gets a tree with a top already started, and he has gained a season in pruning. As a rule, the two-year-old nursery tree will not make as strong a growth as the one-year. The one-year seems to stand transplanting better, and after several years' growth is as far along as the two-year-old nursery tree, and usually comes into bearing just as soon, and for that reason most Western growers, and in late years a great many Eastern growers, are planting the one-year-old nursery tree in preference to the two-year-old.

Pruning the Second Season's Growth. When the side branches are cut back as described on page 30, usually two or more branches will start near the cut end, and some of the buds lower down on the branches will also develop into shoots. The usual practice is to allow two of these new shoots to grow on each branch. They should be some distance apart, one at the end and then one further back and so placed that the formation of crotches will be impossible.

These new side branches are cut back in the spring one-fourth to two-thirds of their growth. All of the other small side branches are cut back to a single bud, so they may later develop fruit spurs, and shade the branches with their clusters of leaves.



(3) The way the tree should be pruned after it has made its second season's growth.



(4) The way a tree should be pruned after it has made its third season's growth. The branches shown in the above diagram form the main arms for the tree, with all of the scaffold branches on which the remainder of the top is built.

your mind and then try to train your trees as near as possible to that shape.

In hot climates the branches on the north side of the tree will often grow faster than the branches on the south side, and the north branches must be shortened back to keep the tree uniform in shape. Further, in a hot climate, care should be taken not to open up big gaps in the tree so the sun can get to the main branches and trunk of the tree and injure it.

Always try to look ahead as far as possible. Cut out all unnecessary limbs before they get too large. If two branches show a tendency to form a weak crotch that will split, cut out one of them. It is better to do this while they are small than to take out large branches later on. Remove a superfluous limb before it becomes a nuisance to the tree and has grown large enough to injure the permanent limbs.

Winter pruning stimulates wood growth. A tree that is not in healthy, vigorous condition should be pruned severely in the winter or early spring. When the head of the tree is too thick, cut out the medium small branches. Don't waste time cutting out the small twigs—new ones will grow in the same place next season.

Whenever an unnecessary branch is formed, it should always be cut back to one fruit bud. In this way, the entire length of the branch will bear spurs, so the weight of the fruit will be distributed along the full length of the branch from the very tips into the center of the tree. Some growers cut all sprouts and shoots on the main branches, leaving them bare. If all the fruit is near the end of the branch, it is more apt to break than if the load were distributed along the entire branch.

Pruning After the Third Season's Growth.

The small side branches which were shortened back the preceding year will put out additional branches of their own, and two of these additional branches should be allowed to remain. All others should be cut back to a single bud to form fruiting spurs. The framework of the tree should now be well formed, and require less attention from this time on. Surplus branches or those inclined to form weak crotches should be removed. Too vigorous growth in one direction should be removed so as to keep the trees in uniform shape. Water sprouts should be removed entirely.

The orchardist should try to train each tree so that it conforms to the ideal as described above. The form of the tree is complete after the third winter's pruning, and the only pruning necessary after that is to remove any diseased or broken branches, to take out enough branches to keep the top of the tree open to the sunshine, and to shorten back any too vigorous growth.

It is not always possible to make them develop just the way you want them to grow, but you should have a certain definite shape in

Summer Pruning. Pruning at a certain time during the summer, when the leaves are on the trees, tends to check the wood growth and hasten the formation of fruit buds. A vigorous-growing young tree is sometimes slow coming into bearing, and summer pruning is often used to check the growth and start the trees to producing fruit. No large branches are cut at this time (none over $\frac{1}{2}$ to $\frac{3}{4}$ inch in diameter).

The pruning is done after the tree has made its growth, in the first part of the summer, when the new shoots form terminal buds. This is usually about the time of what is known as the "June drop," when the young apples are about 1 inch in diameter. The method of pruning is the same as used during the winter-time, and the same effort is made to improve the shape of the tree.

Planting Distances

The usual distance for apple tree is 36 feet apart. On very thin soils and for slow-growing varieties, such as Duchess and Wealthy, and for upright-growing varieties, such as Yellow Transparent, Wagener, and Wilson Red, 28 to 30 feet is the distance generally used.

For strong-growing varieties, especially in the northeastern part of the country, trees are planted 40 and sometimes 45 feet apart. Where these greater distances are used the grower does not prune back his tree, but lets it get very large, which it will do in a cool, moist climate in a fertile soil. However, it is hard to prune, spray, and pick fruit on these very tall trees, and most growers prefer, by planting closer, and by pruning back and thinning, to keep the tree from growing too large. When a number of different varieties are planted in an orchard, they should be planted uniform distances apart to aid in cultivation. For number of trees per acre, see page 20. For method of laying out the orchard, see page 12.

Soil

For apple trees a fertile loam is generally preferred. However, there are almost innumerable exceptions. Some of the best and most profitable apple orchards are along the eastern shore of Lake Michigan, where the soil is composed almost entirely of sand. Many good orchards are located in the Ozark country, where the soil is a mixture of stiff clay and loose flint rock. The most important thing is to have a soil that is well drained and the total depth of the dirt at least 3 feet, the deeper the better. For further information in regard to soil, see page 11.

Cultivation of Orchard

The advantage and necessity of cultivation are so well known it is not necessary to go into them here. There are some growers who follow the special sod mulch system, but it has not proved generally satisfactory, and it is not to be generally recommended, except on the steep hillsides, where the ground washes badly.

Plow the orchard in the early spring, just as soon as the ground is dry enough to work. Use an ordinary turning plow. Follow the plow with a spiked harrow or a cutaway disc if the ground is rough, then go over this with a smoothing harrow or a drag. Then cultivate the orchard often enough to conserve all possible moisture.

The Planet Junior cultivator or smoothing harrow can be used for this purpose. The object is to maintain 3 to 4 inches of loose mulch on top of the ground. On very rocky land it is necessary to use a spring-tooth cultivator; on sandy land there are several different cultivators that are preferred in different sections of the country. Whenever there is a hard packing rain the soil should be gone over with a disc harrow to loosen it up, and then the weekly cultivations continued with a general cultivator. This system of cultivation keeps down the weeds, retains the moisture, and promotes the growth of the orchard.

About the middle of the summer a cover crop should be sown in order to retain the fertility of the orchard. Where a good dressing of manure can be put on every year it is not necessary to sow a cover crop; but very few are so fortunate as to get all the manure they require at a reasonable price, so cover crops are necessary to keep the soil supplied with humus. If the season is very dry and there is a big crop on the trees the cover crops can be omitted for one year in order to hold the fertility until the very end of the growing season for the benefit of the fruit on the trees. However where this is done repeatedly the soil will lose its fertility and the trees will suffer from lack of nourishment. Some orchardists often sow clover or vetch in midsummer and allow the orchard to remain in sod the following year. This can often be done to advantage once every four or five years.

The best cover crops are cow peas, soy beans, crimson clover, and vetch for the central and southern sections; soy beans, vetch, and red clover for the northern sections, and quick-growing crops, such as rye and buckwheat, that can be plowed under in the fall or spring.

In a young orchard that is just getting started, it is often advisable to plant crops between the rows and the cultivation will serve for both. Whatever system is used, it is absolutely necessary that the young trees be well cultivated and kept in a thrifty, growing condition. If you get the trees started right the first season and keep them growing well, the rest is easy. If you neglect them for a season and allow them to become stunted, you will have to do extra work to overcome this handicap.

Stop cultivating the young orchard about midsummer. Don't force it to grow late in the fall; because, if the trees are making a new growth when winter comes on, they are very apt to be injured by severe cold.

In the West no irrigation water should be applied the latter part of the summer. Many orchards have been killed by late summer irrigation, which forced out a new growth just as the cold weather came on. However, it is often advisable to irrigate in the early fall after all growth has stopped, in order to keep the ground from drying out during the winter.

The ordinary turning plow is satisfactory for plowing in the orchard. In order to get close to the tree, it is necessary to use a small one-horse turning plow. The usual disc harrow can be used. However, most manufacturers make harrows with extension heads, so you can work in close under the tree and at the same time keep the team far enough away to avoid injuring the branches.

The Clark Cutaway Harrow Company, Higganum, Connecticut, make a double-action disc harrow with a double row of discs which is especially good for working the orchard.

The spring-tooth harrow is good on stony land, but is not satisfactory on wet land. The smoothing harrow or spring-tooth harrow is especially good for the weekly cultivations after the ground has been put in good tilth. The teeth should be arranged so they can be set at any desired angle. They are also made with extension heads, so they can work in under the tree without skinning the branches.

The ordinary corn cultivator can often be used where the orchard is not large enough to justify buying special tools. In the cotton and tobacco sections of the country, the regular tools used in growing these crops can be adapted to the orchard use.

Thinning

Thinning more than pays for itself. It makes for regular crops. When you have a full set of fruit, take off half to three-fourths or more. You will get just as many bushels, and there will be very few wormy or imperfect ones, because they can be removed at the time of thinning. It

is better to do it when the apples are about 1 inch in diameter. If you do not take off enough the first time, thin again later on.

A tree can produce a certain number of bushels of fruit, and if you thin, the remaining apples will be larger, so you will get just as much fruit as if you did not thin. If the tree overbears, it will not only hurt the quality of the fruit, but the tree may be so weakened that it will bear little or no fruit the next year.

The apples are borne on small "fruit spurs." These spurs only bear every other year; therefore, if you allow them all to bear one year, none of them produce fruit the next year.

Remove all imperfect or wormy apples and carry them from the orchard. Feed them to the hogs or destroy them. Do not allow any clusters to remain, but only one apple to the spur. A general rule is to remove all the remaining apples so they are 6 to 10 inches apart on the branches.

A young vigorous tree seldom needs thinning. The amount of the crop can be controlled to a certain extent by pruning out a part of the surplus wood. After it is ten years old, however, the fruit should be thinned every year. The amount of fruit that a ten-year-old tree can bear depends on its size, vigor, and variety, but it is somewhere in the neighborhood of ten bushels. No hard-and-fast rules can be given, as the amount of thinning depends on the conditions.

Borers: There are two kinds of apple borers. They are a different insect from the peach borer, but the treatment is the same. (See page 47; Spraying, see page 73.)

Crabapples

Crabapples are exceptionally hardy and for that reason are planted in some sections where other fruits can not be grown, but they are generally adaptable like the other apples, and the method of planting and growing is practically the same.

They can be planted several feet closer than other apples, but it does not pay to break up the uniformity of the orchard by having one narrow row of crabapples.



Burbank Plum trees, North Manitou Island, Michigan, average five baskets of plums per tree, which sold at \$1.25 per basket on the Chicago markets.

Pear

The pear is closely related to the apple, and is treated in pretty much the same way. Pears are successful in the northern half of the United

States and in the fruit districts west of the Rocky Mountains. In the Southern States only the Garber and Kieffer should be planted, as they are the two varieties most resistant to blight. On sterile soils the pear does better than the apple. It thrives on high, sterile clay knolls, where apples would not thrive at all. It does well on thin, sandy land. However, it makes the best growth on moderately rich, porous clay loam.

If planted on very fertile loam, it will make a rapid growth and is apt to be attacked by the blight. One reason that it thrives on clay soils and on sterile sandy soils is that it does not make much growth and is not so apt to be attacked by the fire blight.

Pear orchards are often kept in sod, as any method of cultivation causes them to grow too fast. Use very little or no manure about pear trees. It stimulates the growth, so they are more apt to blight. Either the one-year or two-year pear trees can be had from the nursery. Directions for digging the holes, setting the trees, cultivating, and pruning are the same as for apples, which see under page 29. It should be remembered that pear trees are very upright growers, and in pruning always cut to an outside bud, so as to make them spread out as much as possible.

Planting Distances. The usual distance for planting standard pears is to set them in squares either 18 or 20 feet apart each way. Dwarf pears can be used as fillers or they can be planted in blocks by themselves. The fruit of dwarf pears is just as large as the others, but the trees never attain the same size, and for that reason they are set 10 to 12 feet apart. For further information in regard to the dwarf pear, see page 41.

Pruning the Pear. In a general way, the pear is pruned at planting-time, and thereafter in about the same way as the apple, although on very fertile soils it should be pruned a great deal less, otherwise it may develop a large number of water-sprouts, which are easily infected by blight. These should be cut or pinched off as fast as they appear. Light pruning does not harm any variety of pear, and is very beneficial to such sorts as Anjou, which is tardy coming into bearing and the young trees are inclined to drop their fruit after it is "set." Severe pruning in the winter will prevent this and insure a good crop of fruit. The trees should be cut back each year, and some of the new wood that may have been forced by the pruning should also be cut out. When once the young trees begin to bear, there will be little trouble about shedding.

The Duchess d'Angouleme is a splendid variety of pear, and is grown very extensively as a dwarf. It does not succeed when grown as a standard.

Pears should not be allowed to ripen on the trees. They will have a better flavor and will keep longer if they are allowed to ripen after they have been picked. The pear is the only fruit the quality of which is improved by picking before it is fully ripe. They should be picked just before they begin to be soft, but after they take on a suggestion of color and when the fruit will separate from the twig easily. They should be wrapped in paper and placed in boxes in a cool dark cellar until they ripen. Even the Kieffer and Garber, which are only fair quality, are good for eating and cooking when handled in this way. If allowed to hang on the tree until ripe, these varieties will be coarse and gritty around the core.

Fire blight is most common on pears, although it occurs on apples. It is the most serious handicap to pear-growing. It can be controlled by special treatment, and where this is done pears are one of the most profitable fruits grown, as the market is never half supplied.

The treatment for blight is not as difficult or complicated as it may sound to one who has never tried. It is not so very expensive, for, once

the blight is under control, it is not much trouble to keep it out of the orchard, if the trees are examined and treated regularly. We have seen some very profitable crops of pears raised in orchards treated by this method, when the neighboring orchards were half-ruined by the blight.

Fire Blight

Fire blight is the name commonly given to this disease, which has several different forms. It is sometimes called twig blight, fruit blight, pear blight, sun-scald, canker, body blight, apple blight, root blight, and blight canker.

It is a bacterial disease which attacks mountain ash, pear, apple, quince, Juneberry, haws, and other closely-related plants. It has also been reported on plum and apricot. The pear suffers more than other fruits from the ravages of blight, and spraying will do no good; however, the disease can be controlled with profit.

The pear has always been a great revenue-producer in nearly every part of the country, except where there has been serious trouble with the blight, and now blight can be controlled by proper methods and careful attention, as demonstrated by Dr. Waite.

All of the different forms of fire blight in apple, pear, etc., are caused by a germ, or bacteria, named *Bacillus amylovorus*. This is a microscopic plant, which, like the fungi, belongs to a very low order. It is rod-shaped and so low in the scale of plant life that there is only one cell to each individual. It is approximately 1-2000 of an inch long—this means that it is so small that hundreds of them may stick to a claw of a bee or any small insect.

It has a number of long hair or whip-like processes (flagella), which enable it to move about in the sap of the diseased plant. This bacteria multiplies by the very simple process of dividing into two parts at the middle. In about half an hour these two parts have reached normal size and divide again, and so on until thousands have been produced from a single individual in a very short time.

It attacks all parts of the tree and the first infection is in the spring usually in blossoms. The bacteria live during the winter in "hold-over" cankers on the large branches and limbs, and are carried by flies, wasps, and other means during the spring to the blossoms, causing blossom blight. Bees also spread them from blossom to blossom.

From the blossom they work down, causing spur blight, and later there may be an epidemic of "fruit blight," both of which are more or less associated with the "twig blight."

On the trunk, there are usually growing water-sprouts. These water-sprouts are infected from the twigs or cankers, and because the water-sprouts are of sappy growth, the blight works down them, and thus gains entrance to the main trunk or large branches. In this way the disease gets a foothold in the older wood. If it were not for the water-sprouts, it would be unable to penetrate the thick bark of a branch or trunk, unless it were through a pruning scar or an injury caused in cultivation. Following is a more detailed description of the various effects of blight, all of which are caused by the same bacteria or germ.

Blossom Blight. The bacteria spend the winter in some few of the old blight cankers on the branches or trunk of the tree. They are alive along the margins of the canker next to the healthy bark, and during the warm, moist spring days they increase so rapidly that they ooze out in small sticky white or brown drops, through the small cracks and holes in the diseased bark. These drops are composed of innumerable bacteria and a sweet sticky substance, and bees, wasps, or flies lighting here get the bacteria on their claws. When an insect goes to a blossom for nectar, the blossom is infected, but it takes eight or ten days for inoculation; in the meantime the petals often drop.

The blight first becomes apparent in the blossoms, and the young twigs, causing their bark and leaves to be discolored, to shrivel and then die. These blighted twigs look as if the entire twig or blossom had been scorched by fire, but the leaves and blossoms cling to the tree for some time, and often dead leaves are seen hanging on the bare branches during the winter. In the apple, the blight is usually confined to the small new twigs or flower clusters, and the trees usually outgrow the effects of its ravages in a short time. The early apple crop may sometimes be destroyed by the blight, but ordinarily it merely thins out the crop. The disease spreads during the period of most rapid growth of the trees, and attacks those trees making the most vigorous growth. It usually ceases rapid development during dry weather.

Fruit Blight. The epidemic of fruit blight sometimes follows one of blossom blight. It will affect green fruit, but seldom directly attacks the fruit after it is ripe. Some of the blossoms may escape and develop fruits and these later be infected either by the spread of the disease through the twigs or from direct inoculation by curculio and other insects. The fruits which are killed in this way become mummies. A mummy is a partially grown fruit that has dried up, forming a hard, wrinkled lump. It has not rotted as fruits usually do. This is partially due to the fact that it hangs on the twig after it has died, remaining suspended in the air instead of falling to the ground. As a rule, mummies fall to the ground, sometimes before they have time to dry up; but in fruit blight they often hang on through the entire winter, and their presence on the dead branches, along with the bunches of dry, burnt-looking leaves, indicates fire blight.

Blight Canker, on the large branches and the trunk should receive special attention, because it is in these that some of the bacteria live through the winter and cause infection early in the spring. They gain entrance into the thick bark on the branches and limbs through first entering the soft, sappy tip of a water-sprout, and working downward, and through pruning scars or injuries caused by cultivation. It is believed that aphids and leaf hoppers are especially active in the inoculation of water-sprouts and young twigs. In twig blight of old trees, only the current year's growth is killed. In young trees, it may go down the twig to the main branch as in a water-sprout.

The bacteria may work for a while and form a small canker and then all of them die, or they may work actively for a while and then, after remaining quiet, continue to spread so the canker is outlined by several concentric rings. A definite boundary line between the dead and live bark usually indicates that the bacteria in that canker are all dead. When all of the bacteria die, the bark is eventually sloughed off and the tree tries to heal over the wound. When the canker is an active one, the advancing margin can often be distinguished by a slight swelling at the outer edge and the somewhat scalded, watery appearance of the bark. This is not always very apparent, and must be noticed closely in order to be seen.

The bacteria are alive and actively engaged in the destruction of the bark only at the outer margins of the canker. An enzyme which they secrete enables them to make an opening in the cell walls, thus passing from cell to cell. This poisonous enzyme kills the cells of the tree and at the same time it drives out or kills the bacteria themselves. They do not work in the sap tubes, neither are they very often found in the woody parts of the tree, but generally in the soft growing layer of the bark, which is the most vital part of the tree. For this reason, the live bacteria are found only near the outer edges of the canker, which has an indefinite outline. There are other kinds of cankers, some of which are caused by fungi, and are mistaken for the "blight canker." The true blight canker is found most often on the body, trunk, and limbs of a young tree, usually eight to fourteen years old.

The diseased area is sunken, and not swollen like the cankers caused by New York apple tree canker. The surface of the blight canker is usually brown, smooth, and not cracked or checked, although there are concentric rings showing the different periods of activity. The freshly-cankered tissues near the edges of an active canker are watery. There are never little pimples like those on the surface of cankers caused by fungi, although sometimes, after the bark has been killed by the blight, a saprophytic fungus may gain foothold. A saprophytic fungus is one that lives only on dead tissue; it doesn't attack live tissue. A parasite attacks living tissue.

Remedy. This disease can be controlled, but, because of its nature, spraying is of no help. In controlling it, several things should be taken into consideration. Blight is nearly always present in the orchard, and will be carried chiefly by insects (it is never blown by wind, although the wind may control the flight of the insects), and there is no known means of absolutely preventing infection. Three years out of five—depending on weather conditions—this infection is apt to cause serious loss in certain sections of the country. To control the disease, begin to fight in the autumn by inspecting all trees. First, begin at the bottom and examine closely the trunk and branches, then go to the top of the tree and work down. Remove all diseased limbs, sawing them off at least 3 inches back from the canker, and cut out all of the cankers with a sharp knife. Cut away the bark 1 inch beyond the outline of the canker if the outline is distinct; 3 inches if the outline is not distinct. Remove all the diseased bark, disinfect all wounds and tools with a solution of corrosive sublimate (mercuric chloride—poison). It is very necessary that each wound be disinfected thoroughly with the solution. Disinfecting the tools alone is of very little help. This solution is made by adding one part of corrosive sublimate to a thousand parts of water. When the corrosive sublimate solution has dried, paint the large wounds with a coat of white lead and raw linseed oil paint. This disinfection must be given careful attention. It is also a good plan to go over the orchard a second time in early spring, for cankers overlooked in the first inspection.

A few cankers may be the source of infecting the entire orchard the next spring. The regular pruning may be done at this time. Also cut down all old, uncared-for apple, pear, quince, hawthorn, and wild crab on your place, and then get permission to cut down those on your neighbors' land. They are dangerous. If it is not practical to cut them out, keep them cleaned up in the same way you do the trees in the orchard.

When the petals of the blossoms begin to fall in the spring, go over the orchard, thoroughly examining for blighted twigs and cankers which may have escaped the winter inspection. Break off all fruit spurs as soon as they show blight; rub off with the hands from the trunks and limbs all young water-sprouts as fast as they start whether they show blight or not. However, don't bother fruit spurs, unless they are diseased. After a little experience, it is possible to distinguish a diseased twig before it actually wilts and dries up. It is not necessary to disinfect the wounds of these small spurs, but the trimmings should be collected in a bag, carried by the operator, and burned. Where a fair-sized water-sprout or twig has the blight, cut it out with a pruning knife, and disinfect it with corrosive sublimate solution.

About a week later go over the orchard a second time, and continue to do so every week. It must be gone over repeatedly and thoroughly to be of any benefit.

Tools. For winter pruning a light single-edge pruning saw is necessary. If the trees are large, a carpenters' saw may also be required. For clearing out the cankers, use a sharp-hooked, pointed pruning knife. Carry the corrosive sublimate solution in a half-gallon bottle or jug. Also have a can or pint cup fastened about the workman's waist and in this carry a

sponge, to wet the wounds with the corrosive sublimate in the half-gallon bottle.

A light ladder is necessary in an old orchard. For the late prunings have the same bucket of solution and can and sponge. Also carry a light pruning saw, a pair of short heavy pruning shears, and a sharp heavy pruning knife. An orchardist should always carry a good pruning knife.

Other means of helping to hold the blight in check should be given consideration. Where there is trouble with the blight, do not cultivate your pear trees, except enough to make an average growth. On fertile ground, the orchard can be left in sod. Manure or other nitrogenous fertilizers should not be used on pears, except in special instances, because they induce a rapid growth, and such trees are more subject to blight.

Resistant Varieties. No known variety is absolutely proof against the blight. However, some varieties are more resistant than others. They all vary in susceptibility with the locality. The Kieffer is the most resistant, and its value depends as much on the vigor of its growth in recovering from an attack of blight as on its resistance. Other resistant varieties are Duchess, Garber, Seekel, and Anjou. Those most susceptible to blight are Bartlett and Clapp's Favorite, etc. However, the same variety may suffer more in one section than it will in another.

Apple. Crabapples are subject to blight, especially Transcendent; also the Russian type of apples, such as the Yellow Transparent, and Red Astrachan. Other susceptible varieties are Ben Davis, Spitzenberg, and Newtown Pippin. Rhode Island Greening is subject to blossom blight. Some varieties are subject to twig blight and not to canker blight, and vice versa. Blight is seldom serious in apple.

Pears as Fillers. Standard pears should not be used as fillers in an apple orchard; because, if the apples are given as much cultivation as they should have, the pears will make a very rapid growth and be more subject to blight. Dwarf pears, however, can be used as temporary fillers in an orchard. Where the pear is grafted on dwarf roots, it doesn't make such a rapid growth, and for this reason is preferable to the standards as fillers. The dwarf stock doesn't give the pear any greater resistance to blight, but it merely prevents the tree from making a rapid growth.

Fake Remedies. Every one has heard of a sure remedy for blight, but none of them have ever proven of value when put to a test. Some of these remedies reported as successful are calomel injected in the tree through slits in the bark, the application of some form of iron in the fertilizer, also sulphur, and many others. Those may have appeared to check the blight in some instances, but such was really not the case. The blight does its work very quickly and it often happens that the germs have ceased their work before the diseased parts show the effect, and the fruit-grower thinks that the remedy checked the blight, rather than that the blight had already ceased its development. Some of the so-called remedies are harmful.

Quince

The quince is closely related to the pear, but it has two habits that make its treatment different. It is a very slow grower, and the blooms are borne on shoots that have been grown the same year, instead of on old spurs as in the case of the pear. The quince does best on fertile, heavy soil. It will succeed on sandy land, but will not live as long unless the ground is fertilized regularly. When planting on sandy ground, set trees 10 feet apart; on strong ground, 12 to 14 feet apart. Trim the roots, and set trees as described on pages 17-18-19-20.

The quince is naturally a low, bushy grower, and should be headed low, cutting off the main trunk 16 to 18 inches above the ground. Prune and train the branches very much the same as for the two-year apple and pear.

As the tree grows older, the branches from the central part of the tree should be cut out each spring. The quince will come into bearing the second year, and the top should be pruned to make it open and spreading, so that the fruit can be picked from the ground. If the new growth is very heavy shorten a part of it; do not cut it all back, because the fruit is borne on the young shoots which grow on the one-year-old switches, and if all of this one-year growth were cut back, there would be no fruit. The crop can be thinned and controlled largely by pruning, and in this respect the pruning of the quince resembles that of the peach. Spray the same as for pear. Blight sometimes affects the quince, but seldom injures more than the twigs, and by removing the diseased twigs and treating the wounds as described under pear blight it can readily be controlled.

Commercial Peach Orchards



Commercial Peach Growing.

Note the low spreading head in the above peach tree, as trained in the orchard of the late Mr. J. H. Hale, South Glastonbury, Conn. All the fruit can be picked without the use of a step-ladder. Peaches must be picked as soon as they are ready to ship. Large commercial growers are planting a succession of varieties, including early, medium and late, so as to make the harvest cover a longer season and enable them to handle a big acreage with a comparatively small force.



Young J. H. Hale peach orchard, with an intercrop of cantaloupes, grown by Roland Morrill, of Benton Harbor, Michigan.

Peaches

Peaches are grown successfully in every part of the United States except the northern part of Maine, New Hampshire, Wisconsin, the Dakotas, etc. They are not generally grown in southern Florida or the low country around the Gulf of Mexico. With few exceptions, peaches will grow in almost any of the localities where apples are grown. Where the thermometer goes 20 degrees below zero every year or so is as far north as peaches can be grown commercially. If the cold continues for a long time, and the trees are not in a healthy condition, the fruit buds may be killed, and even the trees may be killed. On the other hand, some of the varieties have withstood as low as 25 to 30 degrees below zero for a very short time, when all other conditions were favorable.

Peaches are not adapted to northern Maine. On the other hand, they do well in certain sections of Ontario, Canada, because of the protection given by the Great Lakes. Large bodies of water modify the climate.

Peach trees are also susceptible to injury by late spring frosts, which occur when the trees are in bloom. They bloom early and it takes very little frost to kill the bloom. The successful peach-grower depends more upon a good location, free from spring frosts, than on any other one thing. The high elevations and the locations near large bodies of water are especially favorable for peach growing. However, there are thousands of square miles in different parts of the country where bud-killing spring frosts are unknown, or so infrequent as to be almost negligible. There are some sections where the crop is lost frequently through spring frosts, but that danger has been overestimated. There are countless localities where peaches can be grown successfully where there are no peach orchards.

The peach growing industry has been highly developed in a few localities, where thousands of acres are planted to peach orchards, and the peaches from these sections are shipped all over the country. Very few markets are supplied with home-grown peaches, and there are great opportunities in every part of the country for establishing orchards and supplying local markets.

Soil for Peaches. The peach is not so particular in regard to soil as some other fruits. They will thrive on very sandy soil, gravelly soil, rocky soil, or clay soil. In a general way they prefer a sandy loam. This is especially true in the northern United States, where the lighter, warmer soils produce better quality and high-colored fruit. Some of the best orchards are along the shores of the Great Lakes in Michigan, Ohio, New York, where the soil is composed almost entirely of lake sand. Some very fine peach orchards are



This is an ideal shape for a young peach tree, as trained by the late Parker Earle, of the Redland Heights Ranch Co., in Southern California. This is a two-year-old J. H. Hale, which produced a number of very large peaches the second season. They have 15,000 of these trees.

located over in Ontario, Canada. The late Mr. J. H. Hale's orchards at South Glastonbury, Connecticut, are on sandy loam on the granite hills overlooking the Connecticut river. In the central and southern regions, heavier, stronger loams and clays are preferred, especially in Georgia and Alabama. The extreme heat in the South burns the fertility out of the sandy soil.

Peach trees as they come from the nursery are either known as "June-budded" or "one-year" trees; no one grows or plants a two-year-old peach tree. The June-budded tree is usually very small. The top is one year old and the roots are one year old, and it is propagated by a special method, known as June budding. The so-called one-year peach tree, which is used most largely, has a one-year-old top and a two-year-old root. Peach trees should always be headed with an open spreading top and vase form as described on page 30.

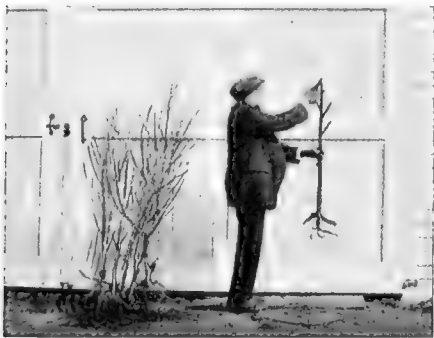
All peach trees should be headed low. Some growers cut off the trunk 6 inches above the ground and form the top on that 6 inches. Others cut off the trunk 24 inches above the ground and form the top there. Probably the best distance is from 12 to 18 inches. Avoid forks or weak crotches, which will split.

The peach is entirely different from other fruits. It is naturally a slender grower, and comparatively short-lived. It can be trained so that all the fruit can be picked from the ground without the aid of a step-ladder. The wood is very brittle and light, and the branches break easily, which is another reason for having it low-headed.

The peach trees should be pruned regularly, and heavier than any other tree. To get good fruit it is necessary to prune severely. The peaches are borne on the switches that grow the preceding year. A switch never bears but one crop, and the result is, if it is not pruned back each year, the new growth where the fruit is borne will be farther and farther from the center of the tree, until the branch finally breaks off.

For setting the tree and pruning the roots, see pages 19 and 20.

Pruning the Tree at Planting Time As soon as the tree is set, cut off the main trunk 12 to 15 inches above the ground. Cut all the remaining branches within 1 inch of the tree, leaving one or two good buds. During the first summer some growers pinch off all but three to five of the branches that start to grow. However, the more progressive growers allow the trees to put out as many branches as they will the first summer and encourage them to make as strong a growth as possible the first part of the season.



How to Prune Large Size Peach Trees at Planting Time.

Sometimes the extra large size trees have side branches that are as large or larger than an ordinary lead pencil, and there are very few buds near the base of these large side limbs. These extra heavy limbs should not be cut back closer than within 5 to 6 inches of the main trunk. This picture shows the late Mr. J. H. Hale pruning one of these extra heavy trees. Note length of the stubs in this particular case.



Pruning One-Year-Old Peach Trees at Planting Time.

One-year peach trees are always branched. Cut off the top at the desired height, usually 12 to 18 inches, above the ground. Then shorten back side branches to one or two sound buds, as shown above.

Early in the spring after the second season's growth the tree can be trimmed up so it has a central trunk. From this are four main branches, and from each of these main branches there are two to three side branches. If there are more than two or three side branches, they should be cut out before the third season's growth starts. A peach tree can be made to bear the third year by special pruning, but it is not recommended. It should bear its first full crop the fourth season. Early in the spring of the fourth season cut out all branches that interfere with others, also cut out all that are growing in the wrong direction. If any of the branches have made a much larger growth than the others, shorten them back so as to keep the shape of the tree uniform. Or, if the branches are inclined to be slender or willowy, shorten them back so they will be thicker and stronger and can bear heavier loads of fruit. In pruning, it is generally best to cut off just above the bud on the outside. This will make the tree have a spreading, open top. (See page 33.)

The peach tree should bear a full crop the fourth season, and it should be pruned regularly every year. There are many different ideas about pruning the peach tree, but all agree that it should be pruned regularly and heavily.

Early the next spring cut off all but three to five of the branches. Four is a good number. These should be well spaced around the trunk, so as not to form any weak crotches or forks. Many growers cut back these remaining branches one-third to two-thirds of their length. However, we believe that if only one-fourth of these side branches are cut off, they will form just as good a top and make a better growth. Of course, if one branch is especially long, it should be shortened back to about the same length as the others, so as to make the top uniform.

During the second season's growth each of these branches should put out a number of side branches. Some growers pinch off all but two or three of these side branches, leaving one near the end, and then one at either side of the older limb. However, as said before, it is better to let the young tree make as much growth as possible during the growing season, and then do the heavy pruning in the winter or early spring.

A plan used by many successful growers is to take out some of the older wood each year, often cutting back two or three season's growth in the center of the head. Also a part of the new growth is shortened back at the end of the branches. However, the good side shoots along the main branches which have been forced out by the pruning should not be cut, as they produce some of the best fruit.

Shortening back the new growth at the end of the branches not only stimulates the growth of the tree the following season, but it amounts to a thinning of the fruit, because the peaches are borne on this new growth. Orchardists often dislike to cut out so much of the bearing wood, and so they allow the tree to spread out more than it should. However, when a freeze gets the bloom, then they go in and prune very heavily, so as to give it a lot of new wood the following season. Also, if a tree has been injured by a very severe winter, it should be pruned very heavily, in order to stimulate the growth and overcome the bad effects of the winter injury.

The exact amount of pruning depends upon the vigor of the tree. On very fertile soil the tree must be pruned heavier each year than on lighter sand soils. The main branches of a tree should never be allowed to get long and straggly, and, if the foliage is thin and the growth irregular, the tree should be pruned heavily to stimulate the growth. On the other hand, if the tree is pruned too heavily, it will throw out a good many long, sappy switches. The orchardist has to study the growth of his trees and prune according to their needs.

Dehorning Old Trees It is sometimes recommended that an old orchard be "dehorned;" that is, the old tops cut off, leaving only the central trunk and stubs of the main branches about 1 foot long. This is a bad practice. Where it is necessary to cut back old trees very severely, remove the branches back to three or four-year-old wood, thus leaving stubs on the main limbs from 3 to 4 feet long.

Renewal Pruning There is another system of pruning that is not generally known, but one that has been very successful on sandy soils along the Great Lakes; this is to start a system of renewal pruning. In this system the grower does not shorten back the new growth, but rather renews the tops of the trees in the same way. The first six or seven years the trees are trained as described above; then, as they get about seven or eight years old, the largest of the branches is removed, cutting it off at the central trunk. When this is done, there should be a central shoot in near the base of the branch to take the place of the branch that was cut out. Where there is not such a shoot to take the place of the large branch, one can be forced out the year before the large branch is to be removed.

An experienced pruner can shorten back a main branch and force out a shoot just where it is needed near the base of the large branch. We know of an orchard where the trunks of the trees are twenty-five years old and yet none of the branches are over seven years old, and this orchard is as vigorous and productive as younger orchards in that locality. And other orchards that were planted at the same time as this orchard played out some years ago.

In this method the new growth is not shortened back, although enough of the side branches are removed to keep the head open, and the trees are trained with vase-shaped, spreading tops, so the fruit can be picked from the ground.

Thinning. It is necessary to thin peaches in order to get good fruit. As mentioned above, this can be partly regulated in the pruning. If a tree has been well pruned in the early spring, the thinning consists of removing all imperfect peaches; also, where there are clusters, taking out all but one, and thinning down the remaining peaches until they are 6 to 7 inches apart. If the tree was not well pruned the preceding year, they should be thinned down to 8 or 9 inches apart, or, if the tree is not in

good healthy condition, they should be thinned to 8 or more inches apart. Where a tree has set a full crop, this means that one-half to two-thirds or more of the peaches are picked off. This should be done as soon as you can get at the work, usually about the time the peaches are $\frac{3}{4}$ or 1 inch in diameter.

Planting Distance Peaches should be planted 16 to 18 feet apart, depending on whether the soil is fertile or poor. In the early days of peach-growing, many of the foremost growers set their trees 13 feet apart, with the idea of forcing the growth, taking off a few crops, and then letting the orchard go; but, as they have learned more about pruning and spraying the trees, the orchard can be made to live and bear much longer, and greater distance is recommended. Some growers are now setting their peach trees 20 feet apart. With this extra room the fertility of the soil can not only be retained, but improved, and when a tree gets too old to be profitable, it can be pulled out and another set. By removing the old trees and resetting, the orchard is made to last indefinitely.

Cultivation of Peach Orchard The peach orchard should be plowed early in the spring. Plow through the first half of the summer and sow a cover crop the middle of the summer. Practically the same methods and tools are recommended here as for the apple (see page 34). However, it is not advisable to let the peach orchard stand over in sod for one year, as may be done with the apple under certain conditions; for many peach orchards are located on sandy loam which is not very fertile, and the cover crops can not be depended upon entirely to make up for the lack of fertility, so it is often necessary for the grower to use fertilizers, which should be put on in the late winter or early spring. The quality and amount depend upon what happens to be lacking in your particular soil. (See Fertilizers, under page 21.) A peach tree should make at least 12 inches new growth each year.

Borers The peach borer is a grub which hatches from an egg deposited in the bark of the trunk by a moth. This grub burrows under the bark and does a great deal of damage if not caught and killed. Examine the main trunk very closely, especially near the ground. You will soon be able to detect the presence of the borer underneath by the appearance of the bark, which looks different from healthy bark under which there are no borers. Frequently the borer can be located in peach trees by the lumps of sticky gum on the outside of the bark. Use a sharp knife and a piece of flexible wire to destroy the borers. Scrape off the rough bark on the body of the tree and paint the wood with a coat of white lead and raw linseed oil paint to prevent rotting. Then the soil should be drawn back to the roots and banked up six inches high around the tree.

Your trees, especially young peach trees, should be gone over carefully at least twice each summer and preferably once during the winter. It does not take long, and, if there are borers in your neighborhood, it will be absolutely necessary to examine them in this way, in order to prevent loss and damage to your trees. The borer of apple trees is a different kind, but the treatment is the same. They can not be controlled by spraying.

Spraying, see page 76.

Apricot

The apricot is closely related to the peach and will thrive on the same soil. They will also grow on soils that are too fertile for successful peach-growing. The apricot is hardier and will stand more cold than the peach. However, it blooms several days earlier and is more apt to be caught by spring frosts, and should be planted on high ground or other locations that are free from late frost.

The apricot trees should be planted as described on page 44, and the first three years they should be pruned as the peach is pruned, cutting back very heavily, so as to form strong limbs. The apricot is a fast-growing tree like the peach, and if it is not cut back, the top will be weak and will be broken down by the heavy loads of fruit and by ordinary winds. However, after the third year, or when it comes into bearing, the strength of the tree will be used up by the fruit and very little winter pruning will be necessary.

Winter pruning stimulates an excessive growth, which is not desirable after the tree comes into bearing, and the main pruning can be done in the summer-time, just after the crop is picked. Shorten back the new growth about one-half and take out any of the dead or interfering branches. As the apricot gets older, it will be necessary to remove some of the old wood from time to time. It is best to take out one or sometimes more of the old branches each year, and in this way the top of the tree is kept within bounds. These large branches should be removed in the winter or early spring.

The apricot produces its fruit on spurs like the plum and also the apple, and it also produces some fruit on the new growth like the peach, and this must be borne in mind in the pruning. If the tree has been producing too heavy a load of fruit, cutting back the new growth will have the effect of thinning the fruit. In spite of this, the tree will often set too heavy a load, in which case it must be thinned like the peach; but because apricots are smaller in size than peaches, they can be left closer together.

Set trees 16 to 20 feet apart. Cultivation and spraying same as for the peach.

Plum

Plums are one of the easiest and most satisfactory fruits to grow. Most of the big commercial orchards are located in a very few states, but plums can be grown in every part of the country. There is more difference between the varieties of plums than of other fruits, and each grower can have the kind that best suits his taste and requirements.

Plums will grow on almost any soil. They will thrive on moist, heavier soil than will the other fruits, but succeed best on fertile, well-drained land. They will grow and produce good fruit in spite of neglect, and have often been called the "poor man's fruit," as they are found in alleys, fence corners, etc. However, they respond readily to care and attention, and should be cultivated and sprayed like other fruits.

Plums should be planted as described on page 19.

When the tree is planted the top should be pruned. Cut out the central leader about 18 to 24 inches above the ground. Cut back the branches to one or two good buds. After it has grown one season, remove all but four or five of the branches from the main head of the tree. Do not shorten these branches back.

The next year and the succeeding years it will be necessary to cut out any dead branches or any that are not growing in the right direction or interfere with others, and a certain amount of pruning will be necessary to form the shape of the tree. Bearing plum trees require even less pruning than the apple. An exception are the sprawling, fast-growing kinds, which demand a severe heading-in every year. On fertile soil the Burbank has to be cut back half to three-fourths, and even then it sometimes grows too large.

Planting Distance. The different varieties of plums have such different habits of growth that no definite distance can be given for planting. In a mixed orchard 12 to 15 feet is a good distance, although Abundance may be set only 10 feet apart, while Burbank should be set 20 feet apart. Italian Prune, Lombard, etc., should be set 18 to 20 feet apart, although by cutting out some of the large branches as the tree grows

older, they can be safely set 18 feet apart. It is not best to crowd plums nor any other kind of fruit trees; and to facilitate spraying, these stronger-growing trees will do better if set 20 feet apart or 24 feet apart on strong soils.

Cultivation and spraying is the same as described for peaches. (See pages 47 and 76.)

Pollination. It is advisable to plant two or more varieties of plums together. The Wild Goose will not bear at all unless it is fertilized with the pollen from another variety, and many of the other varieties of plums are improved by cross-pollination.

Cherry

The cherry may be divided into three groups: The sour cherry, including Dyehouse, Early Richmond, English Morello, Montmorency and Wragg; the sweet cherries, Schmidt, Napoleon, Lambert, Black Tartarian and Bing; and the Royal Duke, a cross between the sweets and sours, having many of the good qualities of both.

Sour Cherries. The sour cherries are very hardy, bloom late, and are dependable bearers. They succeed in nearly all parts of the country except on the low lands in the extreme South and exposed localities of northern Maine, Montana, the Dakotas, Wisconsin, etc. They are one of the easiest fruits to grow, and especially suited for the small home orchard and for planting in back yards or vacant lots. But they must have dry soil. The ground must not only have good surface drainage, but a fairly porous subsoil that permits a good under drainage.

Either one-year-old or two-year-old cherry trees may be had from the nursery. A one-year-old sour cherry tree, when properly grown in the nursery has a well-branched top and has proved to be the most satisfactory.

Cherry trees should be planted as early as possible. If the ground is dry, pour in enough water to thoroughly moisten the dirt. If too much water is used the earth may cake about the roots and injure the tree. Once established they require less care and attention than any other tree, although they respond readily to cultivation. They should be plowed and cultivated as described under apples, page 34.

Dig the holes and trim the roots as shown on page 17. In a dry climate, or when planted late in the spring, several gallons of water should be poured into the holes in order to insure a good start.

Pruning. With sour cherries very little pruning has been the practice, but the experiences of the most successful growers of Wisconsin, one of the principal cherry producing states, and of Michigan, show that the sour cherry tree thrives best when regularly and often heavily pruned. It keeps up the bearing area, reduces winter-killing of blossom buds, cheapens production by making lower trees, and lengthens the life of the trees. These methods described in detail in Bulletin 298, March, 1919, issued by the Agricultural Experiment Station, University of Wisconsin, at Madison, are as follows:

Pruning at Planting Time. Cut off crowding and broken roots and shorten those over 10 inches long. Cut off all but the leader and 4 to 6 of the best branches. Cut these branches back to 2 or 3 strong buds, leaving the leader about 4 inches longer than the branches; 18 to 24 inches is the favored height of the lowest main branch.

Pruning After One Year's Growth. Fully grown trees with 7 to 9 main branches and few laterals are better than those with only 4 or 5 main branches and more laterals. Cut out cross and crowding branches leaving only strong, well-placed branches. Four or five may be left and 3 or 4 more selected a year or two later arising from the leader. If the season's growth is 20 to 24 inches the tops should be cut back about 4 inches.

Pruning the **second** and **third** years after planting. Cut out excess and crowding wood, selecting new main branches and preventing weak crotches by heading back the branches. When two or more branches grow out close together the one cut back the least will make the greatest terminal growth. The leader should be cut back the second or third season by cutting the last season's growth back to a lateral branch.

After 5 or 6 years the tops should be thinned out to admit sufficient sunlight to keep the inner spurs and lower fruiting wood alive. Head back the lateral branches and those which grow toward the center of the top. Annual pruning should be done to avoid heavy cutting at any one time. The amount to prune varies with each tree. The Montmorency is a more upright grower than the Early Richmond and is therefore more difficult to train into a spreading top. Some growers want their trees to bear a crop when very young. This practice is bad in the end, though it may give earlier returns.

Sweet Cherries. The sweet cherry can be grown in many different parts of the country, but is very particular as to soil and location, and not as hardy and dependable as the sour cherry. They must be planted on well-drained ground. They require a deeper and more fertile soil than the sour cherry. They bloom earlier and are most apt to be injured by spring frosts. Sweet cherries are grown very successfully in California, Oregon, Washington, and along the eastern shores of Lakes Michigan, Huron, Erie and Ontario, and in certain sections of Virginia, Pennsylvania, etc. The tree is an upright and more rapid grower than the sour cherry. As they come from the nursery, even the larger sizes are often poorly branched, although they may have good roots and heavy bodies.

When the tree is set, cut out the central leader about 18 to 30 inches above the ground. Some growers shorten back the side branches about a third. In case there is not a good number of side branches, they will be forced out the first season's growth. During the first four or five years the top can be shaped as the grower wants it, but as the tree gets older the less pruning the better.

Planting Distance. This depends on the soil, the location and the variety. A good average distance for small-growing sour cherries, such as English Morello and Wragg, is 16 or 18 feet apart each way. The stronger-growing cherries, such as Montmorency, Early Richmond, etc., 18 or 22 feet apart. The sweet cherries should be planted 24 to 30 feet apart each way. For spraying, see page 74.

Grape

Grapes grow wild in all parts of America, from Central Canada to Mexico, and there are varieties adapted to all situations and to all purposes. However, the greatest development in this country is producing table grapes. There are successful wineries in many states, but only a very small per cent of the total crop is used in making wines, and most of the wines which are made in the East are from the second-grade grapes. The quality of the grape is good, but the bunches are usually imperfect. The grape juice industry has grown to immense proportions, and thousands of tons of the Concord are used every year for unfermented grape juice.

Grapes will grow on almost any well-drained soil. They do surprisingly well in very poor, dry soil where an apple-tree would be a failure. However, if the soil holds moisture and is also well drained, it will produce large crops. It should be moderately fertile for best results, but grapes will succeed on shallow, rocky land where no other fruit can be grown. The early varieties ripen the first part of the summer, so they are seldom injured by drouth.

Some years ago the Experimental Station of Alabama planted a vineyard on a tract of land which was worn out by cotton farming, and was

so badly washed that not even weeds would grow on it. They filled up the ditches and planted the vines, used enough fertilizer to take care of the immediate needs, and drilled cow peas in the space between the rows. The first crop paid a handsome profit over and above all expenses.

Grapes bear about the third year, but where there is a long growing season they can often be made to produce a moderate crop the second season. Prepare the ground as described on page 11. Grapes can be planted either in the spring or fall. There is no risk from fall planting in the Northern States, because the tops can be covered by several shovelfuls of earth, which will protect them from injury from cold. This dirt should be raked off in the spring.

The sooner you get the vines in the ground the longer time they will have to become established. Those planted late in the spring will start growing promptly and make a good growth. But early-planted vines start off early, and, having a longer growing season, make a heavier growth, and for that reason produce a larger crop the first bearing season.



Grape Vines.

Trim off the roots as indicated by the long black line in the above cut. Cut back the canes at the top, leaving two or three sound buds on each stub as indicated by the short black lines.

Pruning at Planting Time Cut back the roots to stubs 8 or 10 inches long. Cut off the tops, leaving two or three sound buds. Many growers allow the vines to trail over the ground the first summer, which is all right if the ground is well drained and the weeds are not allowed to grow. If it is weedy, it is necessary to set a lath, and tie up the young shoots so the ground around them can be kept well cultivated.

If the vine makes a good growth of 5 to 8 feet, the wire trellis may be put up the next year. In the North, where the summers are short, the vine is again cut back to three or four sound buds at the end of the first season's growth, and allowed to grow over the ground, or the young shoots are tied to the stakes during the second summer. The permanent trellis should be set before the second or third summer, depending on the growth which the vine has made, as outlined above.

Time to Prune Grape vines can be pruned in winter any time except when the vines are frozen. Never let them go until the sap starts, because if pruned then, they will "bleed," and the wounds will be longer in healing.

Planting Distance They may be planted 8 to 10 feet apart in rows 8 to 10 feet wide. A good plan is to set the vines 8 feet apart in rows 10 feet wide. The rows should be wide enough for a wagon to drive between them.

Grape vines are sold as one and two-year stock. One-year-old grape vines are preferred by those who have had experience. They cost less, and come into bearing just as soon.

Prepare the ground as described on page 11. Stakes may be set to mark where the vines are to be planted, or a furrow 8 or 9 inches deep may be plowed every 10 feet, then cross furrows every 8 feet, and the vine set at the intersection of the two furrows. It is a good plan to set the vines so you can cultivate both ways, as that will save considerable hand-weeding the first two years before the wire trellis is put up.

Some growers have been very successful in bringing their vineyards into bearing a year sooner by digging the hole with a spade. The bottom of the hole is mounded up a little higher in the center than at the sides. The vine is set in the center of this little mound and the roots spread out in all directions around it, and the dirt put in very carefully, just as you would in setting a tree.

Cultivate the ground thoroughly until the middle of the summer. See page 34 for general rules for cultivation. Cover crops should be used, especially where the soil is thin. A very good plan is to drill in cow peas, soy beans, or Canada peas; stop up every other hole in the drill. This will leave room enough to cultivate between the rows of peas with an ordinary corn cultivator, and you will get just as heavy a growth of peas as if you had broadcasted them, and save enough on the pea to pay for several cultivations, and the vines will make a better growth. See page 21 for cover crops.

There are many different ways of training grape vines in a commercial vineyard. The underlying principles are the same in every case. The one to use depends upon the circumstances, soil, and climate of the individual grower. A grape vine is pruned in order to reduce the amount of wood, and to limit the amount of fruit, and to keep the plant within reasonable shape and grounds.

Grapes must have very heavy annual pruning, and all methods of training the vine depend upon **renewing the fruit-bearing wood every year**. The grower must understand this, and must realize that after the vineyard is once started, as much wood must be cut out each season as grows during that season. If this is not done, there will be too many fruit-bearing canes, which will cause the vine to over-bear, and it will be so weakened the next year that it can not produce very much fruit.

The grapes are borne on the small shoots of the present season which grew from canes of the previous season. To illustrate: During last summer a vine put out a number of strong, vigorous canes or shoots. These were about the size of a lead pencil and several feet long, with a number of buds along their entire length. This coming spring a shoot will grow out from each of the buds along the canes, and the grapes are borne on the new wood near the base of the shoot. If the vine is strong enough, every one of the buds along the cane will make a shoot which will bear grapes, but there are so many of these canes that the vine is not strong enough to produce fruit on all of them.

From this you will see there are two facts which govern the pruning of grape vines.

First, the grapes are produced on the shoots which grew out early in the spring, and if the cane is not cut back the vine will grow longer each year, and the bearing wood will be farther and farther away from the roots.

Second, no vine is ever strong enough to produce fruit on all the shoots which grow from one-year canes, and for that reason the one-year cane must be shortened back, to limit the amount of fruit which the vine will set.

All methods of pruning grape vines are based on these two facts. Every method provides for a permanent arm or central trunk; at the beginning of the season's growth there are a number of one-year canes left on this main trunk. In the fall, after the foliage is off, all the two-year-old wood is cut off and a certain number of one-year-old canes are left to produce the fruit next year. The central arm or stub is the only perma-

ment part about the vine, for all the other canes are pruned off after they have made their second season's growth.

The following systems of training are: The Improved Kniffin System, which is used in the Central, Northern, and Eastern States for practically all varieties except Delaware, which does not make a very heavy growth. The Low Renewal System, which is simple and is considered by many the best for the southern part of the United States, or wherever it is extremely hot during the summer, as the permanent arm is short and very little of it exposed to the hot rays of the sun. For weak-growers like the Delaware, the Low Renewal System is used successfully.

The Improved Kniffin System

The spring of the second year after the planting all of the shoots are cut off except one, which is to be the permanent trunk. This is trained to a temporary stake. Two shoots are allowed to grow out from the permanent trunk about 2 feet above the ground, so that later they can be trained in both directions along the bottom wire of the trellis. Two more shoots are allowed to grow out at about 4 feet above the ground, so that they may be trained in both directions along the top wire of the trellis. The main or central stem is pinched back a little above the two upper shoots, which brings the top of the central trunk about in line with the top of the trellis, 4 feet above the ground. The third year after planting the trellis should be made; two strands of No. 9 or No. 10 gauge galvanized wire, one about 2 feet above the ground, and the other 4 feet above the ground, are fastened to the windward side of the post with wire staples. One post for every three vines is sufficient. Eight-foot posts set $1\frac{1}{2}$ feet deep are preferred, and they should be double-braced at each end of the row.

The spring of the third season there should be a main central trunk with two canes which run in each direction along the lower trellis, and two in each direction along the upper trellis. These should be tied along the wire the coming season, to prevent their hanging down. The fruit will be borne on the small shoots that grow from the four lateral canes early in the spring.

The fourth winter cut off these four-year-old laterals, except the four young canes growing from them near the central trunk, two starting from the main stalk near the bottom wire, and two near the top wire. Also cut back a young cane to a spur with two or three buds near the base of each of these four yearling canes. The yearling canes will bear fruit the next year, while this spur will develop a cane which will bear fruit the year after. Where the vine is not making a vigorous growth, the number of these arms can be lessened or the canes can be shortened back to four or eight buds, thus preventing the vines bearing too heavily. If the vineyard is allowed to over-produce one year, it will bear a light crop the next season.

At the end of each growing season you will have a permanent central stalk or stem reaching from the ground to the top of the trellis. Half-way up the stalk there will be two arms two years old; growing from this side arm there will be a number of young canes, one of which will be left to bear fruit the coming season. The two-year-old side cane will be cut off with all of its one-year-old branches except the one which should be left to bear the fruit next year. Then 4 feet from the ground there are also two yearling canes and two spurs, one of each running in each direction along the top wire.

The Low Renewal Method

The Low Renewal Method is well suited to the *Labrusca* varieties, which are grown principally for table use, as Moore's Early, Concord, Worden, etc. It is especially suited to the central and southern United States, where the summers are hot. It provides for annual renewal and a short arm.

It is very simple and fulfills all the requirements. The vines are allowed to grow over the ground the first year. Don't pinch or prune them, but force the growth. In the fall cut back all the canes near the ground, leaving only a few buds. The second year tie up the canes, as they grow, to a temporary stake. In the fall of the second year prune, leaving one or two canes. Cut away at least one-half of the previous year's growth. The trellis can be built any time during the winter after the second summer. Posts can be set 16 feet apart, between every second vine. Some growers prefer three wires. Two are usually enough, 3½ feet and 5 feet above the ground.

After the second summer the vine can be allowed to bear a full crop. Prune in the fall, leaving three of the one-year-old canes, which start from near the ground, all of about the same length. The two outer canes should be long enough to reach the top wire when stretched at an angle of 45 degrees. The third cane is run straight to the top wire.

Sometimes such a cane will contain twelve or fifteen buds or joints. With a variety that has short internodes or joints like the Delaware, there will be fifteen or twenty buds on a cane of the above length. Thirty fruiting buds are enough for a vine of ordinary strength, such as Moore's Early. Some varieties are stronger and more productive than others, and thinning is often necessary.

Never let a vine over-bear. It will weaken the vine and mean a light crop next year. If a vine is allowed to set a very large crop, it will not be able to ripen it.

Blackberry

Blackberries do well in nearly all parts of the country. They are persistent growers and will succeed on all soils, although they thrive best on a fertile loam. They are later ripening than most other berries, and where the soil is thin and sandy they should be planted on a north slope if possible, as they are less apt to suffer from a dry summer.

The plants should be set in rows 4 to 6 feet wide, with the plants 2 to 3 feet apart in the rows. The upright-growing varieties do not need so much room as those that are inclined to droop. The more fertile the soil the more room the plants should have. The plants put up suckers from the roots so that the row soon forms a continuous hedge.

Setting the Plants The ground should be prepared as shown on page 11. If there are only a few plants to be set, they can be put in with an ordinary garden spade by shoving it into the ground and pressing to one side so as to open up the hole. However, the best method is to plow out a furrow about 8 inches deep along the row where the plants are to be set. Place the plants against the land-side of the furrow. They should be set just as deep as they stood in the nursery row. The foot or a hoe can be used to pull the loose dirt against them, and tramp so as to hold them in place. After the row has been set in this way, the plow should be run back in the opposite direction so as to throw the dirt back into the furrow, and then plants should be given a second tramping, so as to have the dirt around them good and firm.

Pruning at Planting Time The tops of blackberry plants are usually cut off before they are shipped from the nursery. If not, they should be removed, leaving them about 4 or 5 inches long. The blackberry and red raspberry send up sprouts from the roots, and after one or two season's growth form a solid, continuous hedge of the canes; and, unless care is used, a great many of the sucker plants will sprout in the middle of the row. For this reason these two fruits are best raised in the form of a hedge-row. The black raspberry, on the other hand, does not send up sprouts from the roots, but forms a single crown, or stool, and wherever desired it can be planted in check-rows and cultivated both ways. When the new canes are about 18 inches to 2 feet tall,

clip off the tip so as to force them to branch out. It is important that this should be done before the shoots are more than 2 feet tall.

In the drier parts of the country it is sometimes advisable to let the cane grow out without clipping back until the following spring, when they are cut back to 2½ or 3 feet. This does not give as many branches for bearing fruit, and it will not produce as much fruit to the cane, but if it is in a dry country, the canes will have all the fruit they can ripen. Other growers allow the canes to grow tall and fasten them to a wire, which is stretched on posts that are placed in the row. However, the close-pruned bushes are better.

The McDonald Blackberry ripens very early. Growers in southern Missouri and Arkansas, where they have a long season, have found that the entire row can be mowed just after the fruit is taken off, and that new canes will develop from the ground up for the next year's planting. This makes the work much simpler than where the old canes have to be cut out one at a time by hand.

The blackberry should be cultivated thoroughly and often. Do not cultivate deep, as it breaks the roots and causes suckers to grow up in the middle of the row. In Montana, Wisconsin, and the extreme northern parts of New York, Maine, etc., the plants should be given winter protection. To do this, the plants are laid to the north or west, as the tops hold the snow better when placed in that direction. The tips should be weighed down with dirt, to hold them in place; and, after the canes are all bent over and weighted down, they should be covered with a straw mulch.

Orange Rust The orange rust is one of the worst troubles of the blackberry. It is an orange-red rust that appears on the under side of the leaves. The grower should examine the plants early in the season, and as soon as the first indication appears on the under side of the leaves, dig up the entire plant, root and top and burn it. It can't be controlled by spraying, as the fungus which causes it is not only present on the top, but on the roots of the plants. However, it can be very effectively eliminated if the diseased plants are removed as soon as the rust appears, before it has had time to spread to the other plants.

Dewberry

The dewberry is very closely related to the blackberry; however, it will thrive on poor or sandy soils where blackberry or raspberry cannot be grown. It is less affected by drouth than either blackberry or raspberry.

Planting Plant same as blackberry.

Cultivation Cultivate same as blackberry, except that the cultivation should be done in the same direction each time, so that the vines which trail along the ground will be laid in the same direction along the row.

Pruning Prune at planting-time same as for blackberry.

Later Training Some growers allow the dewberry to trail along the ground, and a lot of fine fruit can be produced this way; but it does not produce as much or as fine quality as where they are fastened to a support. There are two good methods. One is to train on an upright wire trellis, same as described for grapes. Another is to set stakes by each plant, and in the spring, before the leaves come out, tie up the canes to the stake and cut back the canes within 3 to 5 feet of the ground.

As soon as the canes have fruited, cut them out. This work can be left for winter, but it is better to get them out of the way as soon as possible and burn them. The new canes can be allowed to trail on the ground until summer, and then tied up, as described. No summer pruning is necessary. One advantage of the stake method is that it is possible to line up the stakes in both directions so you can cultivate both ways and save a great deal of hand labor.

Planting Distance If trained to single stakes, set the plants 4 feet apart each way. If to wire trellis, have the rows 6 feet wide, with the plants 2 to 3 feet apart in the row. In small gardens they may be planted closer.

Diseases See under Blackberry.

Red Raspberry

The red raspberry, like the blackberry, will succeed on almost any soil, but does best on fertile, well-drained loam. In the Southern States it should be planted on a northern slope, wherever possible, as it will produce better when it is protected from the extremely hot sun. Where the land is very thin, the stronger, more vigorous varieties, like Cuthbert, should be planted.

The red raspberry does not make such a heavy growth as the blackberry, and can be planted closer, in rows 4 or 5 feet apart, with the plants 2 to 3 feet apart. The 5-foot rows are generally preferable in the larger plantations, as cultivation is easier. In the small garden and backyard 3-foot rows will be found satisfactory.

The red raspberry can be planted by the same method as the blackberry.

Habits The habits of the red raspberry are the same as the blackberry, and the old canes should be removed as soon as they have borne their fruit. Some growers pinch off the tips of the new canes when they are 2 feet tall, so as to force them to branch. However, this has a tendency to force up a lot of small weak suckers from the roots. The better plan is to let them grow all summer and to cut them back within 2 or 3 feet of the ground in the spring, depending on whether they are a tall or low-growing variety.

The red raspberry sprouts from the roots and will form a solid, dense hedge-row if left to itself, and is very satisfactory grown in that way, although some growers plant them in checks and cultivate both ways. The main disadvantage in the hedge-row is that the canes come up too thick and the fruit will not be of the highest quality. This can be readily overcome by thinning out the sprouts every year, allowing only the strongest ones to grow. Cut out the weak young canes when you cut out the old canes.

Orange Rust This sometimes affects the red raspberry and should be treated as described for the blackberry.

Anthraxnose This is another disease which affects the red raspberry, forming small, gray blisters on the canes, which sometimes grow and run together, giving the cane a diseased, spotted appearance. If there are only a few canes affected this way, they should be cut out and burned. If the patch is badly diseased, some growers mow the patch immediately after the fruit has been picked, and, as soon as the canes are dry, burn over the field. The crop the next year will be reduced about half on account of this treatment, but the canes will be free from this trouble, and the life of the patch extended several years.

This has been a more satisfactory method of getting rid of the trouble than spraying, although some growers use Bordeaux Mixture for the purpose, spraying when the young sprouts are 6 to 8 inches high.

Black Raspberry

The black raspberry will succeed on a wide range of soils, but thrives best on a deep, fairly moist, well-drained loam. The black raspberry forms a single bush, or crown. Suckers do not grow from the roots. It is propagated in the nursery by laying down tips of the canes and covering over. These tips form roots, and when they are ready to dig, the cane is cut from the old plant.

These buds or "eyes" of the top plants are tender and will not stand much rough handling, as other plants. They should be set in the spring. Some are apt to die if they are set in the fall.

Planting Distance Have the rows 5 to 6 feet wide, with the plants 4 to 6 feet apart. A good distance for commercial planting is rows 6 feet wide, with the plants 4 feet apart. In small gardens the rows may be narrower and the plants closer together. When they are planted in check-rows, it is a good plan to set them 5 feet apart each way. They are well suited to planting in checks, because they do not sprout from the roots.

The ground should be well prepared for the black raspberry, and trenches plowed out as described for the blackberry. The plants should be set so deep that the crown will be 3 or 4 inches below the surface of the ground. They will start faster if they are planted shallower, but are more apt to blow over and to suffer from dry weather. When the plants are set out, be sure to cut off the old cane. This will force the new shoots in the crown to grow.

They should be thoroughly cultivated as described under red raspberry and blackberry; however, they can be cultivated deeper than either of the above, as the roots broken in cultivation will not produce suckers or sprouts.

When the young shoots are 8 to 24 inches tall, cut off the tips. This can be done with sheep shears, or pinched out with the fingers. One pinching is sufficient, although it is necessary to go over the patch two or three times, to be sure to get the canes that will come up later on in the summer. It is very important that they be pinched as soon as they are 18 to 24 inches tall, for they will then throw out a number of strong side branches that will bear fruit. Do not let them go until the following spring, as is permissible in the case of red raspberries. Cut out the old canes and burn them just as soon as they have borne fruit. If the plant is strong, not more than five young canes should be left. If the plant is weak or the soil is poor, three or four are sufficient.

Treat orange rust and anthracnose as with red raspberry.

Gooseberry

The gooseberry and currant are two of the hardiest fruits grown, and are found growing wild in the northern United States and many parts of Canada.

The gooseberry prefers a clay loam or clay, rather moist, but not wet. It can not be grown in the extreme southern United States and the Gulf States, although it can be grown in the Central and South Central States on good soil, if it is given some shade from the hot noonday sun. The bushes often thrive where the green fruit is cooked by the extreme heat during the middle of the day and drops off before it is mature. However, the gooseberry will stand more heat than the currant. The Houghton succeeds further south than any other variety. The buds of the gooseberry start growth early in the spring, and for that reason it is best to plant it in the very early spring or in the fall, except in arid countries, where fall planting is never advisable.

Planting The ground should be put in good shape, worked deep, plowed well, and, if it is not strong, fertilizer should be added. Well-rotted manure is best, although commercial fertilizer will do. See page 21, for fertilizers.

After the ground is prepared, mark it off and plow out a good, deep furrow. It is an advantage if this is deeper than actually needed for setting the plants, so that there will be good mellow earth under the plants. Set the plants against the land-side of the furrow and cover them, packing the dirt firmly about the roots. Nothing is more important than having this dirt packed firmly about the roots of the plants.

The furrow can be filled in by plowing back in the opposite direction. Experienced growers find vigorous, one-year plants satisfactory and cheaper than the two-year-old.

Cut back the top of the gooseberry about half. Cut back the roots about half their length. Training the gooseberry is simple. The best fruit is borne on canes two to three years old, and the pruning should be to encourage the new shoots, and cut out the old wood when it gets to be about five years old. On thin land the old wood loses its productiveness after the fourth year and should be cut out then. On stronger land, should be allowed to remain six years, depending on soil and varieties.

Planting Distance In rows 4 to 6 feet wide, with the plants 3 to 4 feet apart in the row. The gooseberry does not put up suckers, and for that reason the plants can be set in checks so as to cultivate in both directions. For spraying, see page 76.

Currant

The habits and requirements of the currant are very similar to the gooseberry. The principle of pruning is the same, but no wood should be allowed to remain after the third year. Usually there should be from four to eight stems and these should be renewed by annual pruning, taking out all wood over three years old. The currant sprouts freely and each year it is necessary to remove some of the young sprouts that are not wanted. The shoots often grow quite tall and, to keep them from being thin and spindling, they should be cut off about 2 or 3 feet above the ground.

Cultivation Cultivation should be very shallow, as the roots grow near the surface. A harrow is good for this purpose.

Strawberries

When to Plant Strawberry plants may be set either in the spring or fall. Northern planters generally set them in the early spring. In the South they often set the plants in the fall. Spring planting is the best for most localities. In early spring the plants are dormant and can be set at this time with little danger of drying out in handling, and they can be transplanted before they form the new roots for the season. In the autumn the plants store up a large supply of food in the crowns and become plump and stocky, and are able to live for a long time on this stored-up food. For this reason it is advisable to plant early in the spring, when the plants are stored full of food, and before they have started growth.

Plants should be ordered early and the nurseryman should have instructions either to ship as soon as possible or ship at a specified date. The sooner you get the plants in the ground the better growth they will make and the more fruit you will get from them. Plants should be shipped in the spring, any time after the first of March until the first of May, although it is sometimes possible to ship to Southern growers as early as the middle of February. Strawberry plants can be sent with trees if the order is shipped by express or parcel post. Plants should never be sent by freight.

Fall shipments can be made about the last of September or the first of October. It is possible to ship earlier than this; however, a large number of plants have not reached their full size before the first of October, and digging before that time means a heavy loss and wastage, so the nurseryman has to charge about twice the usual price for plants dug previous to October 1st.

Location Location, providing there is good drainage, is not as important for strawberries as it is for some other fruits. A south slope will give berries a little earlier in the season, and sometimes they are better colored and better flavored. The northern slopes do not

ripen as soon, but the crops hold on longer and are not affected quite as much during drouthy seasons.

Good drainage comes first. Low, frosty places should be avoided. The cold air settles down in the low places, and it is here strawberries are more apt to be injured from spring frosts. On the other hand, land on small islands near rivers and lakes and along the shores of large bodies of water is less apt to be affected by frost, as the water holds a great deal of warmth and prevents frost injury on nearby lands. For the small home planting and the garden, the only thing to remember is not to plant on land that is wet and soggy for any length of time.

Soil Strawberries will thrive in a great many soils and locations. No other plants can be grown with profit in as many different parts of the country as strawberries. The ideal strawberry soil is a good loam, rich in humus and well drained. It is generally recommended that any soil that is good for corn and potatoes is good for strawberries, but there are thousands of acres of strawberries grown profitably on sandy soils that are too poor for good farming land, and others on rocky hillsides that are too thin for farm crops. In this Ozark country the rockiest land is often the most productive; frequently the flint rocks are so thick on the ground that they form a very satisfactory natural mulch. New land gives best results, because of the several inches of leaf mould plowed under after it is cleared of timber. Thriving as the strawberry does in all kinds of soils, it is impossible to recommend any one kind of soil that will give the best results. It is literally true that all soils are good for strawberries. The one requirement in every case is that it will be well drained.

Preparation of Land The land should be put in a good mellow condition. Such tools as you use in your regular farm work can be used. The land should be fertile, and able to hold moisture without being water-logged. It should be "mellow," so that it can be kept in good condition at all times. The preparation that favors any of the above requirements is always helpful. The land should be plowed deep in the fall or early spring.

As a rule, it is advisable to plow damp or clay soil or sod land in the fall. Otherwise spring plowing is generally favored where it is possible early in the season. In the spring it should be harrowed and disced until it is settled as deep as it was plowed. It is particularly important on spring-plowed land to have the ground well settled before the plants are set.

A good method of plowing is to turn a furrow at least 14 inches wide. Do not turn the soil clear over, but have one edge of the furrow lapped on the edge of its neighbor. The ground should be plowed 7 inches or more if the top soil is that thick. Never plow up more than $\frac{1}{2}$ to 1 inch of the sub-soil at once. Sod land should be planted to a cultivated crop, such as corn or potatoes, for one year, to rid it of a white grub which feeds on the roots of strawberry plants. Many growers prefer to manure heavily in the fall, and plow it under; others manure in the spring after the ground is plowed, discing it in and pulverizing the ground.

In the spring before planting, the ground should be thoroughly chopped up with a disc and harrowed with a spike-tooth harrow. Work the soil until it is pulverized and level. It is generally advisable to follow the harrow with a roller to pack down the earth. Usually a wooden roller is heavy enough for this work, except on very sandy soils. A plank drag is better on clay soils, as a roller is inclined to pack the soil too tight.

Do not fail to remember that on land that you have plowed or disced deeply it is necessary to have it well packed before the plants are set.

Varieties What strawberries are best suited to your soil, location, and requirements? That is the first and one of the most important questions to decide. Must it be an early or a lato variety?

An extra good shipper, or a large fancy berry for market that will pay especially high prices? Different markets and different individuals have different preferences. Some like a round, others like a long berry; some a bright red, others a dark red strawberry. For commercial markets and long-distance shipments the choice of kinds is narrowed down to a few for each locality; but where you are planting for nearby markets and home use, you have a wider range to choose from.

Receipt of Plants When the plants arrive at your station, get them at once. Unpack the box without delay. If you are not ready to plant, dig a shallow trench about 5 inches deep and "heel them in." One side of the trench should be smooth and slope at an angle of 45 degrees. Cut each bundle, shaking out the roots. Lay the plants side by side, with the top of the crown just above the surface of the ground. Cover the roots with dirt. Then another row of plants can be set alongside the first, and so on. In this way a great many plants can be put in a small space.

Preparing the Plants Before Setting Them Just before the plants are set out, remove all the foliage except the growing point and one leaf. This leaf should be the smallest and last one produced by the plant. Cut back the roots about one-third. This can be done very rapidly with a sharp knife. The plants can be placed in a large bucket with a little water in the bottom. Where several men are planting, a boy usually drops the plants just ahead of the men.



A—Too Shallow.

B—Too Deep.

C—Just Right.

The Right and Wrong Way to Set Plants

Strawberries are soft, succulent, shallow-rooted plants, while trees have hard wood and deep roots.

A—This shows a plant that has been set too shallow. The crown is exposed. The air will get to this crown and dry it out and the plant will die. The lower part of the crown must always have moist dirt packed firmly about it.

B—This shows a plant that has been set too deep. The dirt will wash into the top of the crown and the new tender green leaves at the center will rot and the plant will die.

C—This shows a plant that has been set at the proper depth. The lower part of the crown is bedded firmly in the well-packed earth, while the upper part of the crown is free and open, so the new leaves will not have to push through the dirt. The roots should not be crowded together. They should be straight, instead of being turned back or twisted; also notice that all the leaves have been removed except one. In cultivation never loosen the dirt immediately around the crowns of your strawberry plants. The roots, where they join the crown, are always near the surface of the ground and should never be exposed.

Setting the Plants Strawberries are sometimes set by plowing out a shallow furrow, but this is not generally recommended. The best way is to have the ground prepared and leveled as described under "Preparation of Land," and then laid off in rows. The rows can be marked with the regulation corn-marker, or, if the field is small, a string can be used as a guide and the mark made with the edge of a spade. Either a spado or a "dibble" can be used for setting the plants. In using either tool, thrust it into the ground to a depth of 5 to 6 inches, and then work it sideways, so as to open out a deep, narrow cut. Set the strawberry plants in this opening, straightening the roots, spreading them out like a fan. The plant is placed in the ground while the tool is still in the opening. When the roots are in place, draw out the tool, which lets some of the dirt fall back; then set the tool to one side of the first cut, shoving it into the ground again and pressing it sideways over against the first hole, in which you have put the plant. This closes the dirt about the roots and packs it.

Setting the plant at just the required depth is very important. The beginner is liable to set the plants too deep, so the mud washes into the crown, causing it to rot. The careless man often sets them too shallow. Just the right method is described on page 60. Be sure to have the dirt pressed in tight about the plant. There is no danger of getting it too tight. The beginner is almost sure to leave the ground too loose. After the plants are set as described above, the dirt should be further pressed down by placing one foot on each side of the plant, packing the dirt tight about the roots and lower part of the crown.



The Hill System.

The above shows strawberries set in beds. All runners are cut off, so that each plant forms a large hill or stool. This not only gives the largest and finest strawberries, but the most from a given piece of ground, and is especially to be recommended for garden culture where the land is very valuable.

METHODS OF TRAINING. There are three methods of training strawberries: (1) The hill system, (2) the single or double hedge row, and (3) the matted row.

The Hill System The hill system is specially suited for producing large quantities of extra fine fruit on a small space. It takes a little more work, but where the ground is limited or very valuable, as in the case of truck gardens near cities, the hill system is the one to use.

In the hill system the ground is usually laid off in regular beds. The beds are 4 feet wide, with a path between them about 1 foot 9 $\frac{1}{2}$ inches wide. The beds may be of any length desired. The plants are set 1 foot apart in each bed. This allows five rows of plants to each bed. This system requires about 33,795 plants to the acre, or 1,940 plants for a space 25 feet wide by 100 feet long, and as a method of intense cultivation it has given some wonderful results. It requires heavy manuring, fertilizing and cultivation. No runners are allowed to form, the runners being pinched off as soon as they appear. This gives very strong, heavy plants, and new plants grow up beside the mother plant, forming heavy crowns, or stools, which are enormously productive.

The Single Hedge Row System This method is adapted to commercial planting on an intensive scale, and is used by truck gardeners where the land is very valuable. The rows are 2 to 3 feet apart, and the plants 20 to 30 inches apart in the row. Each plant is allowed to produce two runners. The other runners are pinched off as soon as they are formed. These two new runners are trained to grow in the row in line with the mother plant, one on either side. In this way each plant is 6 inches to 1 foot from its neighbor in the row. Large, strong plants are grown, and the berries are somewhat larger and better quality. The surplus runners must be cut. Strict attention must be given to this during the growing season, which makes the system rather expensive.

Double Hedge Row System The double hedge row is the same principle as the single hedge row, except the mother plant is allowed to form either four or six runner plants instead of two. These new runner plants are trained to form three parallel lines, one being the line of the mother plant, which is the same as the single hedge row, and then one row of new plants on each side of the original row. The two new lines are 7 to 9 inches distant from the original row, in the middle. This gives a larger number of plants and berries than the single hedge row system. Plants are usually set in rows 30 inches to 3 feet apart. About one-half of the ground is given to the three parallel lines. There is an open space of about 1 $\frac{1}{2}$ feet between each double hedge row, which can be cultivated with a horse cultivator.

Matted Row This is the most generally used system throughout the United States in commercial beds and in home gardens, and it is especially popular where large acreages are planted to strawberries and where labor is scarce. The expenses are less per acre. The rows are generally 4 feet apart, with the plants 2 feet apart, which takes 5,445 plants to the acre. Prolific plant-makers, like the Senator Dunlap, should be set 12 to 18 inches farther apart, and moderate plant-makers should be set 6 to 12 inches closer. The blooms are pinched off, and the mother plants are allowed to make as many new runners as they will form. The cultivators are always run in the same direction, so the runners, as they push out the middle of the row, are turned back into the row by the cultivator teeth and all the new plants are made to grow in a strip 12 to 15 inches wide. Some growers set the rows 3 to 3 $\frac{1}{2}$ feet apart, but the greater distance makes it easier to keep "the middle" open to cultivate and keep the weeds down.

Pinching Blooms from Newly Set Plants In the standard varieties it is not expected that they produce a crop the first season they are set out. They are cultivated so as to make them form a large number of new runner plants, and the size of your crop the next season depends upon the number and vigor of these new runner plants. For that reason it is essential that all blooms and flower buds should be picked off from the mother plants the first season they are set out, so all their strength will be given to the formation of new runner plants.

The bloom should be picked from everbearing varieties the first part of the season if you want them to form a number of runners. The mid-summer bloom can be left and a crop matured the latter part of the same season in which they are planted.

Cultivation The cultivation of strawberries is very simple. A regulation hoe, with a cutting edge about 4 inches wide, and an ordinary one-horse eleven-toothed cultivator, which has a lever to regulate the depth of the teeth, are best. The cultivation should always be shallow. In a small field a wheel hoe or man-power cultivator, such as the Planet, Jr., Iron Age, etc., is very satisfactory, and a great deal more can be done with them than with an ordinary hand hoe.

The cultivator should always be run in the same direction each time. The newest runners, which get out into "the middles," will be laid back by the teeth of the cultivator. The plants should be cultivated all summer, and, if the matted row system is followed, the new runner plants should be confined to a strip 12 to 15 inches wide. Some growers cover the tips of the runners with dirt when hoeing; however, this is not at all necessary if the ground is loose and mellow, as the plants will take root without any assistance. In cultivation and in hoeing out the rows, the following should be kept in mind—that the strawberry is a shallow-rooted plant; at the same time it is a plant that requires considerable moisture, so the centers of the rows should be cultivated as soon after each rain as the ground becomes dry enough to work, and as often thereafter as possible, every ten days or two weeks. The cultivator teeth should be run shallow, and a loose dust mulch should be kept in the center of the row.

Cultivate so as to keep the ground level. Sometimes early in the season a hard crust forms after a beating rain, and in breaking this crust there are a great many clods turned up near the plants, and the roots are more or less exposed. When this happens, run a wooden roller over the row of plants. It will not hurt the plants, and it will crush the clods and pack the dirt down tight about the roots and bring the moisture to the surface again. Rolling is not necessary except during the very dry weather, and when the dirt has been loosened too close to the plant. If you want the big yields of several hundred dollars an acre, keep on cultivating; do not stop simply because you have killed all the weeds. It pays just as much to cultivate after the weeds are killed as it did before.

Mulching Strawberry Beds A mulch is a covering for the ground, and is usually made by spreading leaves or straw over the strawberry bed. (A dust mulch is made by keeping the surface of the ground thoroughly loosened and pulverized to a depth of several inches by cultivation—see under "Cultivation.") However, a mulch for strawberry beds refers to a cover of some sort of coarse trash. It helps to keep the soil cool and moist during the fruiting season. It keeps the berries free from dirt, which splatters up on them during a rain, affords winter protection, and prevents plants on clay soil from being heaved out of the ground by the alternate freezing and thawing.

In the North this mulch is generally applied in October or November for winter protection. In the South, where winter protection is not necessary, the mulch may be applied just before the fruiting season. In many sections of the Ozark country it is not necessary to mulch strawberries,

as the surface of the ground is almost completely covered with gravel or chips of flint rock, which keeps the fruit clean and forms a natural mulch that holds the moisture in the soil.

The material used for making a mulch is that which is the easiest and cheapest for you to get, will not pack too close to the plants, and will keep the berries clean. It should be as free from weed seed as possible; timothy is especially bad in strawberry beds. Straw, prairie grass, or slough grass are used where available; coarse straw manure is sometimes used, but often contains too many weed seeds. Forest leaves that will not pack down tight are also used.

Corn stalks that have been run through a shredder make a good mulch; pine needles are used extensively in the South. When none of these materials can be had cheaply, a good mulch can be grown by sowing a small patch of corn, sorghum, or Kaffir corn very thickly, so it will grow fine, small stems. A small area, properly cut and cured, will make a mulch for a large strawberry field.

In the North and in the Northwest, where they have drying winds, the mulch is applied about 4 inches thick, and in some places 6 inches thick. The mulch should not be so thick that the plants can not grow through, or they will grow beneath the mulch and will be white and weak. Wherever the plants have trouble getting through, the mulch should be raked off early in the spring.

Number of Plants Required to Set One Acre

1x1 foot.....	43,560	2x3 feet.....	7,260
1x1 foot 6 inches.....	29,040	2x2 feet 6 inches.....	8,712
1x2 feet.....	21,780	2x3 feet 6 inches.....	6,223
1x3 feet.....	14,520	2x4 feet.....	5,445
1x4 feet.....	10,890	3x3 feet.....	4,840
2x2 feet.....	10,890	3x4 feet.....	3,630

To determine the number of plants per acre for any given distance, multiply the distance between the plants in the row by the distance the rows are apart. Take the resulting answer and divide 43,560 by it. The resulting figures will give you the number of plants per acre.

For example: To determine the number of plants, planted 2 feet by 4 feet, required to set 1 acre: $2 \times 4 = 8$; $43,560 \div 8 = 5,445$.

Everbearing Strawberries

The Everbearing strawberry has "made good" in commercial and home garden planting in widely varying parts of the country.

Plants set out in the spring will bear the same summer, and, with sufficient rain or artificial watering, will produce a good crop in the fall and continue to bear until heavy frosts come. The second year they produce a heavy crop in the spring, continue to bear throughout the summer if conditions are favorable, and give another heavy crop after the fall rains.

The plants are hardy, vigorous, and productive, and the foliage is unusually healthy. They succeed on all kinds of soil, can be planted on more fertile soil and in low land where frost threatens the only crop of ordinary, or "standard" varieties.

All strawberries require moisture and fertility to produce the best berries. This is especially true of the Everbearers, because of their prolific and continuous bearing habits.

After planting in the spring, the blossoms should be pinched off until about the first of July.

The best growing method with Everbearers is the Hill or Stool System, described on page 62. Set the plants 1 to 1½ feet apart in rows 3 to 4 feet wide. For the home garden, set in beds 4 to 5 feet wide, with plants a foot apart. Be sure to cut off all runners.

Everbearers should never be planted in the "Matted Row" or "Hedge Row" System.

To insure success, Everbearers must have greater fertility and more moisture than ordinary, or "standard" varieties. In the winter, give them a light dressing of well-rotted manure, which should be worked in by cultivation in the spring.

How often you see a cozy little home nestling among vines, flowers, trees, and with stretches of open lawn! By itself it is only a plain little house, but the flowers and shrubs give it beauty and character, and help wonderfully to make it a home. It shows good taste and thoughtful attention, although not necessarily the expenditure of much money.

Planting is like painting a picture. The trees and shrubs are your colors. The rules for successful planting are simple and few. Plant the outer border of your place with masses of dense, rather tall-growing shrubbery, giving a distinct outline and form to your property. Keep the taller growing plants well back, then the medium-growing, and next the low-growing at the inner edge, forming a dense rounding mass of shrubbery which gradually meets the lawn. Plant rounding masses of shrubbery in the corners, as well as along the boundary line. Avoid too many straight lines and geometrical angles. Have a number of different kinds of plants, but enough of one type in a place to produce a definite effect of rich shade, color, flower, or fruit. Use vines and shrubs, not to display their own characters, but to mask sharp lines of buildings and as a frame for distant views.

Around the house have open stretches of lawn. It is especially important to keep small yards open. A small yard, properly planted around the outer edges, will appear larger than it really is. Don't scatter single isolated shrubs all over the lawn. Don't plant trees or flowers in the center of a small lawn. However, on a large, spacious lawn nothing is more desirable than groups of shade trees or single specimens placed a little to one side of the house where shade is needed.

Plant climbing vines on the porches and arbors. The Dorothy Perkins Rose, Honeysuckle, and Japanese Clematis can be planted on the same porch, giving a succession of bloom. Plant the medium and small-growing shrubs, Roses, Peonies, and Phlox in masses around the corners of the house and to hide the foundation, and in corners of the porches and curves and corners of the walks. Always select the dainty, more refined flowers for planting where they will be seen closely. Put the more rank-growing flowers farther in the background.

There are many different shades of green in leaves and combinations of colors in flowers, which, when mixed, are exceedingly beautiful and interesting; while variation in bark color gives an entirely new change after the leaves are off in the autumn.

A well-planted succession of growing, blooming things about a house are a never-ending source of pleasure, growing more beautiful and attractive every year.

Don't plant trees in the center of a small lawn.

Don't scatter "shoe-button" plants all over the lawn.

Don't have a round flower-bed.

Don't have useless paths, isolated pergolas, iron seats, dogs, rabbits, deer, or other imitations on the place.

Don't plant Silver Maple or Poplars unless you alternate with a good slow-growing tree, with the intention of removing the fast-growing tree as soon as the other has developed.

Don't have terraces near sidewalk. Grade from the house to the walk line with an even slope if possible.

Don't try to establish grass on steep banks. Plant trailing vines which will take root as they go—Honeysuckle and Dorothy Perkins Rose.

Don't plant shade trees closer than thirty feet apart.

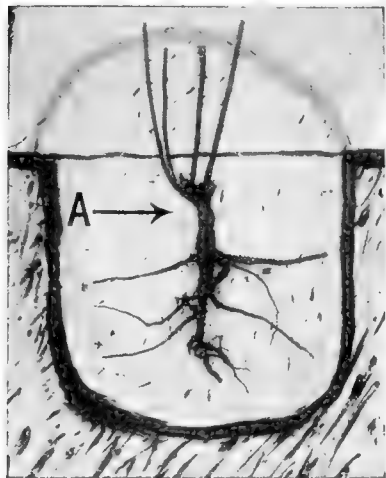
Don't wait—MAKE YOUR COMPLETE PLANS NOW.

Ornamental Trees Dig holes large enough to hold the roots without crowding. Set the tree 2 inches deeper than it stood in the nursery. Fill in the hole with loose, rich dirt, pressing it firmly about the roots; when the hole is nearly full, pour in 2 to 4 gallons of water. After the water soaks into the ground, fill in the balance of the hole with loose dirt.

Pruning Cut off any broken roots and shorten any that are extra long. Cut off the smaller branches and shorten the large ones to four or five good buds.

Roses

The most beautiful of all flowers, the Rose, can be grown in every part of the country. There are several varieties like Snow Queen (White American Beauty) and General Jacqueminot, which are extremely hardy, and will succeed in the Northern States. Even the medium hardy Roses can be grown there if given some protection during the winter. The beautiful Hybrid Teas are hardy, and also the Pink Cochet, the hardiest of all the Tea Roses, which are tender as a class, and can be left outdoors as far north as Philadelphia, and will survive most winters in the vicinity of St. Louis.



Cover the tops of newly planted rose bushes with a mound of loose dirt 6 to 12 inches tall. This prevents the tops from drying out and dying before they can start growth. As soon as the buds swell and start to grow, rake this mound off. When planting budded roses, the point where the bud was inserted in the stock (as shown by "A") should be set several inches below the surface of the ground.

Roses are propagated by two methods; first by growing from cuttings and greenwood tips, which gives a plant on its own roots; second by budding on Manetti or other hardy brier stocks. This method gives a stronger-growing plant, and is necessary for many of the less vigorous varieties. The objection to this method is that it requires some care and attention in pruning, else the brier stock will put out suckers below the bud and eventually crowd it out. The growth from the bud is less vigorous, and sometimes the suckers from the brier stock are allowed to remain, by those who can not distinguish one from the other. This mis-

Roses should have a warm, sunny location. They can be made to grow on any soil, but prefer a deep, fertile, well-drained loam. If you have a stiff clay soil, several loads of sifted coal ashes or sand can be spaded in to improve its condition. To get best results, Roses should be fertilized heavily. You can not make the ground too rich.

Roses can be planted either in the fall or spring. Early planting is the best. Roses can be set by themselves, or planted in hedges, for which the Conrad F. Meyer is especially good. Where they are wanted for display or cut flowers, they should be planted in beds. The beds should be 3 to 4 feet wide—enough for two or three rows of bushes—and as long as desired. The Roses should be set $1\frac{1}{2}$ or 2 feet apart in the bed, depending on whether they are strong growers, like the Pink Cochet and Snow Queen, or small growers, like Annie Miller.

Roses are propagated by two methods; first by growing from cuttings and greenwood tips, which gives a plant on its own roots; second by budding on Manetti or other hardy brier stocks. This method gives a stronger-growing plant, and is necessary for many of the less vigorous varieties. The objection to this method is that it requires some care and attention in pruning, else the brier stock will put out suckers below the bud and eventually crowd it out. The growth from the bud is less vigorous, and sometimes the suckers from the brier stock are allowed to remain, by those who can not distinguish one from the other. This mis-

take is unnecessary, as the sucker growing from the brier stock is easily recognized, for it has seven leaflets instead of five, the cane is nearly covered with thorns, and the sucker coming up from the root is usually several inches from the main plant.

Budded Roses should be set so that the point where the bud was inserted in the brier stock is 2 inches below the surface. Cut back canes one-third to one-half and mound loose earth up around the bush 6 to 10 inches high. (Cover the balance with straw if planting in the fall in a locality subject to severe dry freezing weather.) The mound of earth should be placed about the bush whether the planting is done in the fall or spring, for as much damage is done to the pithy canes of the Rose bush at planting-time by drying out as by freezing during the winter. As soon as the buds start to grow in the spring, rake away the mound of earth and cut back the canes again, leaving two to four buds to each cane. Make this cut just above a sound outside bud, so that the new growth will grow outward, making a shapely bush.

Cultivation Just before the growth starts in the spring a dressing of well-rotted manure or fertilizer should be spaded in.

Deep cultivation is apt to break the roots. Three inches is sufficient. The ground should be kept well cultivated during the summer, and when it is hot and dry they should be watered in the evening. Always put on enough water at a time so as to wet the soil deep, and then cultivate the following morning as soon as the ground is dry enough, and by careful cultivation you can retain the moisture for a week or more.

Roses are well established after the first season, and should be pruned each spring according to their needs; i. e., remove any old or weak canes and shorten back the remaining ones a half to four-fifths in the spring before growth starts. The different varieties of Roses require different pruning, as their habits of growth vary.

The following should be pruned lightly: Annie Miller and Maman Cochet. Snow Queen should be pruned moderately. The following should be pruned hard, cutting back the canes to about six buds: General Jacqueminot, Marshall P. Wilder, and Paul Neyron. The following should not be pruned except to remove old, weak canes: Conrad F. Meyer, Climbing American Beauty, Dorothy Perkins, Rosa Rugosa, and Crimson Rambler. Prune by thinning canes only: Gruss an Teplitz.

Remove the flowers as soon as the petals begin to drop. Do not allow seed-pods to form, except on the Rosa Rugosa, whose seed-pods, or "hips," are almost as attractive as the flowers themselves.

Shrubs

Give the ground a good dressing of well-rotted manure or other fertilizer, and spade it deep. Set the plants as deep as they stood in the nursery row. Protect the roots from exposure. Keep down all weeds. Water if the season is hot and dry. The ground about the shrub should be mulched heavily with leaves or coarse manure the first winter.

Pruning. At planting-time cut back the branches about one-half. Shrubs should not be pruned or sheared heavily, except the Privet and Japan Quince, when used in hedges. Shearing shrubs on the outside without removing some of the inside branches gives the plant an unnatural shape and leads to the growth of many small, weak shoots and poor flowers. Irregular or over-large branches should be shortened back, and weakly ones cut out entirely, but the pruning shears should be used sparingly. There are several exceptions. The Hydrangeas and Altheas, which flower late in the summer and on new wood of the current season's growth, produce better flowers when pruned regularly each winter. Shrubs which flower on wood of the previous season's growth should not be pruned until June or July, when they are through blooming. Deutzia, Spirea, Japan Quince, and Philadelphus belong to this class.

The planting distance depends on the purpose for which the shrub is used, whether for a hedge, a group, or a shrubby mass where the plants do not stand out individually. In this last case they must be set closely, the distance varying with the size which the shrub will eventually attain. As a general rule, the distance between shrubs in a mass should be one-third to one-half their ultimate height. Shrubs, as a rule, should not be planted in the shade. However, Barberry, Deutzia, Japan Quince, Snowberry, and Privet will thrive in shady places. Weigela does especially well in the shade of trees, where many shrubs would fail.

Lilac Spade holes large enough to hold the roots without crowding. Cut off any broken or damaged roots. Set the plant 5 to 7 inches deeper than it stood in the nursery, but do not fill in the last 5 inches of dirt until the plant has made a good growth.

Do not prune the Lilac at planting-time except to remove broken or uneven branches. The Lilac requires little pruning at any time. Remove the withered flowers; any weak branches can also be removed at this time. The branches may be thinned as they need it. Cut them out entirely; do not cut them back.

For hedges, set the plants $1\frac{1}{2}$ to 2 feet apart. For growing flowers for market, 3 feet apart, in rows $4\frac{1}{2}$ feet wide.

Hedge Plants For hedges of Privet, Japan Quince and Barberry, spade up the ground for a strip $1\frac{1}{2}$ feet wide. Set the plants 1 foot to $1\frac{1}{2}$ feet apart in the row, depending upon how dense a hedge is desired. The plants should be set 4 to 5 inches deeper than they stood in the nursery row, but do not fill in the last 4 or 5 inches until the plants have made a good growth. A very desirable hedge can be made by planting a double row. The ground should be spaded for a strip $2\frac{1}{2}$ feet wide. The rows should be set 1 foot apart, with the plants $1\frac{1}{2}$ feet apart in the row. The plants of one row should come opposite the open spaces of the other row.

A good hedge of Spirea can be made by setting the plants $1\frac{1}{2}$ to $2\frac{1}{2}$ feet apart. Roses suitable for hedge can be set 1 to $1\frac{1}{2}$ feet apart. Tall-growing shrubs should be set $1\frac{1}{2}$ to $2\frac{1}{2}$ feet apart.

Climbing Vines

Japanese Clematis Dig a hole that will take the roots without crowding. Put the crown in 1 inch deep. Clematis thrives best on a sandy location, and should have a rigid support. If a string or wire is loose, it allows the wind to blow the plant about so as to injure it. Prune heavily. Cut out all of the weak growth and during the winter prune the remainder heavily if you want the most bloom.

Boston Ivy Set the plants as deep as they stood in the nursery. Protect the top, after the first season's growth, with a mulch of leaves or straw, as the young growth is sometimes injured the first winter after planting. When established it is very hardy. It will climb and cling to wood, brick, rock, etc., anything except an iron support, which gets very hot during the summer.

Wistaria Set the plant as deep as it stood in the nursery. Keep it hoed the first summer, but after that do not fertilize or attempt to force the growth, because it takes several years for it to come into blooming, and it will be even longer coming into blooming if the growth is forced by cultivating and fertilizing. It should have a very strong, permanent support, for it is a long-lived vine and eventually becomes very heavy. The best method of training is to let it alone. It then produces rugged, twisted branches which are very effective. Where it is desired to cover the entire surface of a building or arbor it is necessary to keep the leaders taut and to train the outside branches

wherever they are needed. After the vine reaches the blooming age, it may be made to produce enormous quantities of flowers by cutting back the new growth each year to spurs.

Trumpet Vine Set plants as deep as they stood in the nursery. They prefer very fertile ground and should be fertilized every winter. Especially fine for covering rock walls and rock fences, to which it clings and climbs. Also used in covering buildings.

Climbing Roses These should be planted as described under Roses. The only pruning necessary is to cut out the old, weakened canes.

Peony Planting Peonies can be planted either in the fall or spring. In the North fall-planted roots should have a mulch of several inches of litter or leaves. They thrive everywhere except in the low altitudes of the Gulf States and southern California.

The ground should be spaded deep, 2 feet if convenient. The more fertile the ground the better; however, the Peony is hardy and vigorous, and will give splendid results anywhere. Plant in the early fall or in the spring. Set the crown at least 3 inches below the surface of the ground. If planting in the fall, mulch with 4 or 5 inches of fine earth and leaves, straw, or coarse stable manure. It is advisable to give the ground immediately around the plant a dressing of manure every winter. The rough trash should be raked off in the spring.

Peonies do well for many years without being moved. However, it is advisable to dig them up every seven or eight years and replant them. Cut the roots into two or more parts with a sharp knife. Each part should have three to five eyes. Reset as described above.

When planting Peonies in mass for color effect, set 15 to 30 inches apart, depending on whether the variety is a strong grower. In growing for cut flowers, set $2\frac{1}{2}$ feet apart in the row, in rows $3\frac{1}{2}$ feet wide. The tops die in the fall, and should be cut off. Some people leave them until spring to mark the place, so that the roots will not be dug up by mistake or injured when the ground is worked over.

Iris The Iris is one of the most beautiful flowers, and can be grown anywhere, on all kinds of soil. It will do best on fertile, well-drained soil, and will thrive in spite of neglect where other flowers fail. The Iris can be planted either in the fall or spring. Strong plants set in the fall will give more bloom the first season than those set in the spring. Put the crown of the root about 2 inches below the surface, pressing the dirt firmly around it. Be careful not to get the roots too deep, as they will rot. If planted in the fall, they should be

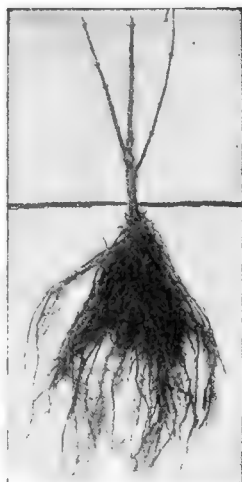


Peonies make strong shoots and the buds can force through several inches of ground. The buds of the crown should be set at least three inches below the surface of the ground.

well mulched the first winter with 4 or 5 inches of loose soil and leaves or coarse manure. This mulch should be raked off in the spring. For planting along borders and in masses for immediate color effects, they can be set 8 or 10 inches apart. If planted in rows, set 18 inches apart, in rows 3 feet wide.

Phlox Spade the ground well and work it fine. Then dig a hole deep enough so the crown or bud will come 1 inch below the surface, and large enough so that the roots will not be crowded. Be careful not to get the buds at the base of the stalk too deep. The old stalk is dead and the new top must be developed from these buds. Press the earth firmly about the roots. If the planting is done in the fall, mulch with 5 or 6 inches of loose earth and leaves. Rake off mulch in the spring. Blooms can be had late in the season by cutting off the tops of some of the shoots as soon as the buds start to form. Plant 12 to 30 inches apart.

The tops die to the ground each winter and should be cut off. Some gardeners leave the dead tops until spring to mark the place, so that the roots will not be dug up by mistake, or injured when the ground is worked over.



Phlox.
The new growth starts from buds at the crown. These buds must be set not more than one inch below the surface of the ground, as shown above.

How to Beautify Your Home Grounds

Since this book, "Inside Facts," was published, it has become apparent that there is a wide demand for more complete information on landscape gardening. This really belongs in a booklet by itself, which is now ready for the public, under the title "How to Beautify Your Home Grounds." This book has 50 pages with over 60 illustrations and diagrams, explaining concisely, yet completely, the correct principles of arrangement and planting.

It describes in detail the best shrubs, hedge plants, climbing vines, roses, lilac, peony, phlox, iris, and ornamental trees, and gives directions on how to plant, prune, and care for them at planting time and after they attain full size.



The most helpful and unique feature is a unit collection system which makes it much easier and more economical to put correct principles into effect and to secure for the beginner results which are expected only from an experienced landscape gardener.

A blue print is included, on which to draw your own plan under the guidance of three other blue prints which show typical plans for a city residence, a suburban home, and a home in the country. There is a nominal charge of 10 cents per copy, but is furnished free to any customers.

NEOSHO NURSERIES COMPANY,
Neosho, Missouri.

Garden Roots

Asparagus Asparagus will thrive in most soils, but does best on a fairly sandy loam. It should have as much sunshine as possible, and the rows should be planted north and south if practicable. To prepare the land, plow deep in the fall. After harrowing, give the ground a good dressing of well-rotted manure. As soon as the ground will permit in the spring, plow under the manure and harrow. Mark off the rows 4 feet apart and open up with a large plow making a trench 8 to 12 inches deep, going over the same ground with the plow several times if necessary. The furrows should all run the same way. Set the crowns or roots in the trench 2 to 3 feet apart in the row, and cover them immediately with about 3 inches of loose, friable soil, which can be easily done with a one-horse plow from which the moldboard has been removed. The trench will become filled gradually during the following season's cultivation. All weeds must be kept down, and the ground carefully cultivated through the season.

In the fall, when the tops are matured, they should be cut, hauled off and burned, and all but 3 inches of the soil removed from above the crowns, so the frost may penetrate and loosen the soil, and the rains improve it. Early the following spring the loose earth must be ridged over the crowns, in order to bleach the asparagus tips. One ridging is not enough. Renew the ridging every two or three weeks during the cutting season, as the rains beat them down. When through cutting the tips, plow down the ridges and run a harrow in both directions. Give a liberal dressing of manure during the growing season, also during the winter.

Stop cutting six weeks after the shoots begin to come up and allow the rest to develop, so the roots may have a chance to get in shape for the next season's crop. Do not cut the young beds for market until the second spring after setting out, and then only for two or three weeks.

In a small garden a simpler method may be followed. Spade the ground 12 inches deep. Set roots 2 feet apart each way, and with the crown 8 to 12 inches deep. Cover the crown with 3 inches of dirt. Keep down weeds by repeated hoeing. After the plants start to grow, gradually fill up the holes at each hoeing. Manure well each winter.

Rhubarb Rhubarb is one of the hardiest plants grown, and will succeed anywhere. However, to get the extra large, crisp stalks, the ground should be heavily manured every year. **(Pieplant)** The ground must be plowed or well spaded. Set the plants with the crown, or bud, 2 inches below the surface, press the dirt firmly about the roots, and, if they are planted in the fall, cover them with a mulch of several inches of leaves or trashy manure. Plant in rows 3½ feet wide, with the plants 2 feet apart in the row. Cultivate as you would any other garden crop. Do not throw the dirt into the eye or crown of the plant, as it will rot out the tender young buds.

The roots will grow very heavy, and after about five years there will be so many eyes that the stalks will be small. The plant should be taken up and the crown cut into a number of plants with a sharp knife. These should have one good strong bud to each plant. Reset the plants as you would in planting a new bed. Pull leaves from the main stalk instead of cutting, so there will be no stub left.



Spray thoroughly and at the right time, if you expect to get perfect fruit.

Spraying Fruit Trees

Spraying is more effective as a preventive than as a cure. Prevention is always the cheapest, but, to be effective, it must be applied before the trees are badly damaged by the insects or fungous diseases. Success in spraying depends on promptness, thoroughness, persistence, and knowledge of what you are doing. It is not always a pleasant task, but it is necessary to produce the high-class fruit which brings big prices.

Do not allow any diseased trees to remain on your place. They are a constant source of infection. Encourage your neighbors to spray also. The example of your success will teach them that it is profitable. However, do not become dissatisfied if you do not always get the results you think you should. If you fail, there is a reason for it, and it will pay you to look around and find out what that reason is. Also, spraying is not a cure-all. When an orchard is old and has been neglected, it is necessary that it be brought into proper shape by pruning, cultivating and fertilizing the land. (For building up fertility of land, see page 21.)

Become familiar with the habits of the insects or fungous disease which you are fighting, giving special attention to the way they affect your trees under your own conditions. Climate has an influence and should be taken into consideration. In the West the hot days of middle summer drive the aphids from the trees. It would be useless to spray for

them at that time. As another example, the cold days of the spring will delay the appearance of codling moth. For that reason you should delay your spraying accordingly.

In the following pages we have outlined a system of spraying for apple and peach which gives a number of combined sprays that will control most of the insects and fungous diseases of those particular varieties. But no complete outline can be given that will cover all the details of each case. For that reason, to be most successful, study the special needs of your orchard. This is better than following the cut-and-dried formula blindly, without knowing why you do certain things. Study the needs and habits of the different varieties of fruits in your orchard. For example, the Ben Davis family of apples are more subject to "Bordeaux spray injury" than some others. This is especially true where the climate is humid. These varieties have not suffered seriously from attacks of scab, bitter rot, or other fungous diseases on the fruit. For that reason they would not require spraying with Bordeaux as often as many other varieties. Leaf spot is the worst fungous disease of the Ben Davis family, but this can be easily controlled.

Spray thoroughly. If a small branch is overlooked, it may infect the entire tree. Watch the men doing the work, see that the tree is sprayed from all sides, as well as from below and above. Spray at the right time. Fungous diseases and insects all pass through several stages of development and at certain times in their life history they can be killed by spraying. For that reason the spray should be applied at the critical time when the pest is vulnerable. Have all spraying apparatus ready beforehand. See that the various connections are tight, the hose in good shape, and the pumps and engine in working order.

Except in case of spraying the apple for codling moth, do not spray when the trees are in bloom, unless you wish to reduce the yield of fruit.

Have a supply of all spray materials necessary for that particular work. Keep them in a place where they can not possibly be used by mistake, and have them carefully labeled.

Arsenical spray should not be applied to fruits within two weeks before they are to be picked.

Insurance is as valuable in the fruit-growing business as in others, and spraying is one of the best forms of insurance. Even though an orchard has no apparent sign of San Jose scale and other insects, it should be sprayed at least once a year, during the winter, with boiled lime-sulphur solutions or an oil emulsion.

If there are any fungous diseases or insects, but little or no fruit that particular season, spray just the same, so that there will be healthy buds and few insects for the next season.

Injury to Foliage Bordeaux mixture sometimes injures both leaf and fruit, causing a characteristic russeting on the latter. Sometimes this is due to a poorly made mixture. However, there are cases when it is unavoidable. These unavoidable cases usually occur during hot, moist weather, but this is the time that the spray is needed most, and should be on the trees. Prepare the mixture carefully, and in spraying cover the trees with a thin film, but do not drench them with Bordeaux mixture, especially during hot weather. Watch the preparation of each batch of mixture. Most failures are due to carelessness in preparing the mixtures and lack of thoroughness in applying the spray to the plants.

Apple Spraying

Many of the insect poisons, such as lead arsenate, can be combined and applied at the same time with fungous sprays, as Bordeaux mixture and lime-sulphur. By combining these and making a certain number of

applications it is possible to combat several insect pests and fungous diseases with each application. Following are outlined complete spraying systems which are designed to control the principal pests of the different fruits. The four sprayings recommended under apple, as a rule, should be made regularly each year. The same is true of the peach. However, some of the fruits seldom require all the sprayings outlined in the system. For that reason, watch the trees and vines closely, and, where the pests are not present, the spraying necessary for the control of that particular insect or disease may be omitted. However, it is usually a good plan to spray with the boiled lime-sulphur in the winter, even though no San Jose scale seems to be present. It is very easy to overlook it, and, once it gets a start, it spreads rapidly. The lime-sulphur wash is not only good for scale, but for destroying a number of insect eggs. (For preparation of spray mixtures, see page 77.)

The different sprayings necessary to control the principal insect and fungous diseases of the apple can be combined and applied so that four will be all that are necessary.

First. The first spraying should be done in the winter or late spring, when the trees are dormant. Use boiled lime and sulphur. This is effective against San Jose scale, oyster-shell scale, blister mite, and scab, and also destroys eggs of plant lice.

Second. The second spraying should be made just as the leaf buds open, and before blooming time. This should consist of Bordeaux 3-3-50 and 2 pounds of arsenate of lead. It is effective against case-bearers, bud moth, and scab, and is especially important in the control of the scab, canker, and leaf spot.

Third. The third spraying should be made just after the petals fall from the blossoms. Use Bordeaux 3-3-50 and 2 pounds of arsenate of lead. This is for the scab, leaf spot, case-bearers, and especially for codling moth. The poison should be directed, under high pressure of 100 pounds to 200 pounds, into the blossom end of the young fruit. The calyx closes shortly after the petals fall. For this reason the third spraying is most important for the codling moth and should be done as soon as possible after the petals fall.

Fourth. The fourth spraying should be done ten days to two weeks after the third. Use Bordeaux 3-3-50 and 2 pounds of arsenate of lead. This is effective against codling moth, apple spot, sooty blotch, and bitter rot.

Careful spraying should be accompanied by good cultural methods. Keep down the weeds. Don't allow any briar patches, foul fence-rows, or half-dead, worthless fruit trees in the neighborhood of your orchard. They harbor insects and may infect the entire orchard with some disease. Burn all trimmings at pruning time.

Cherry Spraying

As a rule, the cherry does not require spraying as often as the apple. If no rubbish heaps, brush piles, or old dead trees are in the neighborhood, and ordinary care is given to cultivation, it will not be necessary to follow a complete system, except in special cases.

First. The first spraying should be in the early spring or late winter, with boiled lime-sulphur. This is for the San Jose scale, Forbes scale, Putnam scale, the lecaniums, etc. The last two are not serious pests, as a rule, while the San Jose scale does not attack sour cherries to the same extent that it does other fruit trees. If careful examination is made of the orchard and none of these are found, the first spraying may be omitted.

Second. The second spraying should be just before the blossoms open, with Bordeaux mixture, 3-3-50 and 2 pounds of lead arsenate. This is an important spraying, in the control of the rot, on the sweet cherries of

the Northwest, as the Bordeaux is effective against the rot and lead arsenate is directed against the curculio, which helps spread the rot. This spraying is seldom necessary in the East.

Third. The third spraying should be just after the blossoms fall. Use Bordeaux 2-2-50, lead arsenate 3 pounds to 50 gallons. This is the most important application against the curculio, and should be applied carefully. Also controls rot and leaf spot.

Fourth. The fourth spraying should be made ten days to two weeks later. This time use self-boiled lime-sulphur. This is for the rot and the leaf spot, and will not discolor the fruit, which will soon be ready for market, as the Bordeaux mixture would.

Fifth. The fifth spraying should be made after the fruit is picked, using Bordeaux 2-2-50. It is directed against the leaf spot, and if the tree is healthy, it may be omitted.

Protect the foliage from injuries after the fruit is picked just as carefully as in the fore part of the season, so that the tree enters winter in a good, vigorous condition.

Grape Spraying

Spraying is essential in the grape as in other fruits. However, cleaning up leaves, burning out the old borders of the vineyard, and stirring the soil is very effective. Also remove all leaves and "mummies," or dried grapes, from the wires. This clean-up is better in the fall than late in the spring. Cleaning up and burning all the leaves is especially important in combating the grape flea beetle, the grape berry worm, the grape cane gall-maker, and the leaf hopper, or grape thrip.

First. The spraying should be before the buds open and is for the anthracnose. Use Bordeaux 5-5-50. This spraying is unnecessary if there is no anthracnose.

Second. The second spraying should be given just as the buds are swelling. This is for the flea beetle, and lead arsenate, 3 pounds to 50 gallons, should be used. This and the first spraying are often unnecessary.

Third. The third spraying should be just before the blossoms open, or about the time the second leaf is out. Use Bordeaux 5-5-50, lead arsenate 3 pounds. This controls the berry worm, curculio, black rot, and mildew, and is especially effective against the berry worm and the rot, which often causes serious loss. Give this spraying particular attention.

Fourth. The fourth spraying, just as the fruit sets, is also very important, and the same materials are used as in the third.

Fifth. This spraying is ten days to two weeks later than the fourth. It is for the mildew, black rot, curculio, and berry worm, also the root worm. Spray with Bordeaux 5-5-50 and lead arsenate 3 pounds to 50 gallons.

Sixth. This should be about the first part of July, not later than the middle of the month; for the Southern parts of the country a week or so earlier. Use Bordeaux 5-5-50, lead arsenate 3 pounds to 50 gallons. This is for mildew, black rot, curculio, root worm, and, most important of all, for the berry worm. It should not be made too near grape-picking time, as some of the spray material will stick to the fruit, injuring its appearance.

If there is black rot, you should spray after each rain. This is especially important in controlling a bad case of black rot. The reason for spraying after each rain is that the rain has washed off the former application and the vines should be given another coating, so that it will be there when the next rain comes. The damage is done when the water is on the vines. The little spores of the rot germinate in the water, and if the spray material is not on the vines before the rain, it will be too late to apply it afterward.

Pear Spraying

This system is practically the same as for the apple. However, as mentioned in the first part of this chapter, it is not always necessary to follow out a complete system each year. (Spraying will not help the fire blight. It requires special treatment. See page 38.)

First Spraying. Early spring or winter, before the buds open, use boiled lime-sulphur for San Jose scale, oyster-shell scale, scurvy scale, psylla, and pear leaf blister mite.

Second Spraying. Just before the blossoms open, use Bordeaux mixture 3-3-50 and arsenate of lead 3 pounds for scab, leaf spot, leaf-eating insects, and leaf blight.

Third Spraying. This should be made just after the petals of the blossoms fall. Use Bordeaux 3-3-50 and arsenate of lead 3 pounds for scab leaf blight, leaf spot, leaf-eating insects, and the codling moth. This is especially designed against codling moth, and the spray should be directed under high pressure into the open calyx cups of the blossoms.

Fourth Spraying. Ten days to two weeks later, use the same spray materials as in the third. This is for the control of the same insects and fungous diseases as in the third.

Peach Spraying

The system of spraying peach is somewhat different from that of apple. Never use Bordeaux mixture on peach trees in the summer, as it is very apt to kill the leaves. Use self-boiled lime-sulphur when the trees are in leaf.

First Spraying. The first spraying should be done during the winter, before the buds start to swell in the spring. Use concentrated lime-sulphur wash (see page 79). This is for the peach leaf curl, scab, and rot. Do not use it after the buds start to swell. The lime and sulphur will burn them. When the leaf curl is widely spread, this application should be made in the early spring, just before the buds swell.

Second Spraying. The second spraying should be made about the time the shucks, or calices, of the fruit are dropping off. Spray with arsenate of lead 2 pounds and quicklime 2 pounds to 50 gallons. This is for the curculio.

Third Spraying. Two weeks later, or about a month after the petals drop, spray with 8-8-50 self-boiled lime and sulphur and 2 pounds of arsenate of lead. This is for the brown rot, scab, and also the curculio, which help to spread the brown rot.

Fourth Spraying. About one month before the fruit ripens, use 8-8-50 self-boiled lime and sulphur. This is for the brown rot and scab. (See page 72 for directions for preparing spray materials.)

Plum Spraying

For plums, use the same materials and system as recommended for the peach. Never use Bordeaux mixture on Japanese plums, such as Abundance, Burbank, and Red June, as it sometimes injures the foliage.

Spraying Small Fruits

Currant and Gooseberry Spraying

The system of spraying currant and gooseberry as outlined is complete, but it is seldom necessary to make all the applications.

First Spraying. Before the leaves open in the early spring, use boiled lime-sulphur. This is for San Jose scale, scurvy scale and oyster-shell scale.

Second Spraying. Just as the leaves are opening, use Bordeaux 3-3-50 for leaf spot and mildew. On the gooseberries, one application may be made just before the leaves start to unfold.

Third Spraying. Make this application two weeks after the leaves start to unfold. Use Bordeaux 3-3-50 and lead arsenate 3 pounds to 50 gallons for leaf spot, imported currant worm, and mildew. This application usually stays on long enough to destroy the currant worms when they appear. If the rain washes most of it off before blooming time, another special application should be made immediately.

Fourth Spraying. This application should be made about two weeks after the third for leaf spot and mildew. Use self-boiled lime and sulphur or potassium sulphide. Bordeaux could be used, but it is apt to spot the fruit. After the fruit is picked, it may be necessary to spray once or twice with Bordeaux for the leaf spot. Do not neglect the foliage merely because the crop has been removed. The canes should make a good growth for next season.

Blackberry, Dewberry and Raspberry **First Spraying.** Use boiled lime-sulphur in early spring, when the canes are dormant. This is for rose scale, San Jose scale, etc.

Second Spraying. Just before the leaves unfold, use Bordeaux 3-3-50. This is for the anthracnose. A special spraying should be made when the buds are swelling. If the pale brown byturus is present, use lead arsenate 3 pounds to 50 gallons, and apply thoroughly.

Third Spraying. Apply this when the young canes are about 6 inches high. Use self-boiled lime-sulphur. This is for the anthracnose and leaf spot, and should be directed toward the young canes. Do not get any more than is absolutely necessary on the bearing canes.

The preceding pages are for the protection of fruit, as well as the foliage and body of the bearing tree.

Young Trees

A young tree, after planting, should be sprayed as the case demands, but seldom is it necessary to follow a complete system before the orchard comes into bearing.

The young orchard can be effectively sprayed with a hand pump. Just after the leaf buds open, spray with a combined poison (preferably lead arsenate) and fungicide (dilute lime-sulphur or Bordeaux—note exception, page 76). If there are no near-by orchards which will infect the young trees, and if it is not a particularly rainy season, no other summer sprayings are necessary. However, watch the trees and be ready to spray them promptly if a pest is noticed. Remember, this applies to young orchards and to mature trees during an off year, when there is no fruit—and remember that the trees should be kept in a sound, healthy, growing condition, whether they have any fruit on them or not. Protect the foliage. The growth of the young trees and next year's crop on the mature trees both depend on healthy foliage. Spray each winter with concentrated lime-sulphur solution when the trees are dormant.

Spray Mixtures

Don't change any of the formulas unless you care to experiment, and then you should do so only in a small way, and with knowledge of the reactions of the solutions with which you are working. Don't think, because a certain solution is good, that double the strength is better. It might kill your trees. Don't try to dilute your solutions to make them go farther. You may get rid of part of the insects or fungous diseases, but not entirely. The few that remain will probably reproduce so fast that there will be just as many as over in a short time. Their complete destruction is necessary.

Spray Mixtures for Rots, Mildew, Etc.

These mixtures must be prepared carefully. If too weak, they are useless, and if too strong, they are apt to "burn" the foliage. They must be applied at the right time. Their effectiveness depends upon their being on the tree before the little spores which make all the trouble germinate. These little spores appear at a certain time in most cases. They require rain-water or dew, in which they germinate. If the fungicide is sprayed on ahead of time, it will be present in the drop of rain-water or dew on the leaf, and when the little spore germinates and starts to grow, the fungicide will kill it before it can get down into the tissues of the leaf, where it is out of reach.

Bordeaux

Mixtures (3-3-50)

Copper Sulphate (Bluestone)..... 3 lbs.
Quicklime (unslaked)..... 3 lbs.
Water.....50 gal.

Dissolve the copper sulphate in water at the rate of 2 pounds per gallon (use wooden or earthen vessels). Where a large quantity of spray is used, it saves time to prepare a large amount of stock solution, using exactly 2 pounds of copper sulphate per gallon of water. The most convenient method is to weigh out the proper amount of copper sulphate, place it in a burlap sack or piece of loosely woven cloth, and hang it in the water just below the surface. It melts faster this way. Weigh out the lime to make the mixture, place it in a barrel and add water slowly until it has slaked, then add enough water so that it stirs readily, diluting to a known volume. By making up quantities of stock solution in this manner, it saves weighing out the material for each tankful of spray.

To make the mixture, pour in 1½ gallons of the stock solution, which should contain 3 pounds of copper sulphate; fill the tank three-fourths full of water, and stir well; then add stock solution of milk of lime containing the equivalent of 3 pounds of quicklime. Stir and dilute to 50 gallons. Never mix the two concentrated stock solutions. Do not use an excess of copper sulphate. If the lime is impure and does not neutralize all of the copper sulphate, it will burn the foliage. To test this, add a few drops of a solution of yellow prussiate of potash (1 ounce to 1 pint of water) to a little of the Bordeaux mixture, and if a brown color appears, add more lime. Add lime until no brown color appears on testing.

For apples, domestic plums, cherry, and pear, use 3-3-50 mixture, as described above.

For grape, use the 5-5-50 mixture (5 pounds of copper sulphate, 5 pounds of quicklime, 50 gallons of water). Do not use Bordeaux mixture on Japanese plums, peaches or apricots. Keep the sediment well stirred up when spraying. When properly made, there is a little danger of burning the foliage, if the mixture is applied during hot, moist weather. (See "Bordeaux Spray Injury," page 73.)

Self-Boiled Lime and Sulphur

Lime (Quicklime).....10 lbs.
Sulphur (Flour).....10 lbs.
Water.....50 gal.

This self-boiled mixture may be used on the foliage in the summertime. Place the lime in a barrel and almost cover with cold water. When the lime begins to slake, add the 10 pounds of flour of sulphur, which should be free from lumps. The sulphur should be made into a thin paste with a little water before adding. Gradually add enough water to the mixture of slaking lime and sulphur to make a thin paste. It will boil for several minutes. As soon as the lime is through slaking, add additional water to prevent further cooking, stir and dilute to 50 gallons, and spray on thoroughly. When spraying, the mixture should be agitated continually to prevent the lime from settling in the bottom of the tank.

Self-Boiled Lime and Sulphur for Peach and "Jap" Plums

Same method as given above.

Lime.....	8 lbs.
Sulphur.....	8 lbs.
Water.....	50 gal.

This is best made up in quantities sufficient for 200 gallons; i. e., 32 pounds of lime and 32 pounds of sulphur. Always add sufficient cold water to cool the mixture when the lime is through slaking. If allowed to remain hot for some time, too much of the sulphur will go into solution, thus causing burning of the foliage.

Spray Mixture for Eating Insects

The materials which come under this head are all poisons which are sprayed on the fruit and foliage. Only the eating insects which bite their food from the surface can be controlled by the poisons.

The poisons are generally combined with the fungus sprays, applying both at the same time.

Arsenate of Lead

Lead Arsenate.....	3 to 5 lbs.
Water.....	50 gallons.

Buy the paste form. Mix thoroughly with a small amount of water before adding to the spray solution. This prevents lumps and clogging of nozzles. Use 3 to 5 pounds for 50 gallons, depending upon the kind of insect to be killed. This can be used alone or with the Bordeaux mixture, or with lime-sulphur. It should not contain free arsenic. Free arsenic burns the foliage. It takes more pounds of lead arsenate than it does of Paris green, but the cost is about the same, as the price per pound of lead arsenate is less, and it sticks to the leaves two or three times longer than the Paris green. If pure, it will not burn the leaves. Because of this fact, it is especially adapted for use on trees with tender foliage, where large quantities of poison are required to kill those beetles which are hard to poison. For general spraying, this is the best form of poisons.

Contact Spray Materials

Many insects have long beaks. They stick their beaks into the leaves or fruit and suck out the juice like a mosquito. They can not be poisoned, and a spray which kills by contact is necessary.

Soap (hard, soft, or whale oil).....	1-2 lb.
Water.....	1 gal.
Kerosene.....	2 gal.

The above proportion gives a concentrated stock solution. Larger amounts may be used in mixing, if a vessel of suitable size is at hand. Dissolve soap in hot water (rain-water or other "soft" water is preferable).

Take the vessel some distance from the fire and add kerosene (crude petroleum may be used instead of kerosene), agitate it with a paddle or, better still, use a small hand pump, working it back and forth for five minutes or until it becomes a thick, creamy liquid. The free oil should never separate from this and rise to the top, either in the stock or dilute solution. For San Jose scale and other uses on dormant trees, take one part stock solution to five or seven parts water. For plant lice on foliage during the growing season, take one part stock solution to ten or fifteen parts water, depending on the insect to be killed and the tenderness of the foliage of the plants on which it is used.

Quicklime.....	20 lbs.
Sulphur (Flour or Flowers).....	15 lbs.
Water.....	50 gal.

This is different from the self-cooked preparation and is for use during the winter, when the trees are dormant, and there is no danger of injuring buds or foliage. Put 20 pounds of lime in an iron vessel, which should hold 20 or 25 gallons. If it holds 50 gallons, all the better. Add water (preferably hot) to the lime, until it starts to slake. Then add the

sulphur and stir. Continue to add sufficient water to keep the lime slaking, but not enough to completely cover it. When the lime has slaked, add 10 or 15 gallons of water and boil over the fire for three-quarters of an hour. As it cooks, the solution should take on a dark reddish or greenish orange color. This is the sulphur going into solution. When through boiling, dilute to 50 gallons, and strain before transferring to the spray tank. The straining is to prevent the small particles of grit and trash clogging the nozzles.

A steam boiler may be used instead of an open kettle. Slake the lime in a barrel, add the sulphur and water as above. Steam may be carried into the barrel by a rubber hose or, preferably, an iron pipe, which should extend down into the liquid. The top of the barrel should be covered with heavy sacking to prevent too rapid escape of the steam. The mixture should be boiled in this way for three-quarters of an hour. This is considered the best wash for San Jose scale and other scales, and should be applied thoroughly to all twigs and branches, covering the entire surface thoroughly. Although lime and sulphur is best known as a contact spray for winter use on San Jose scale and other pests, it is also very efficient for peach leaf curl.

A number of companies also make a concentrated solution, which is usually sold in barrel lots, and should be diluted, 1 gallon to 8 or 11 gallons of water for winter use, depending on the strength of the stock solution. It can be purchased from Sherwin-Williams Paint Company, Cleveland, Ohio; Grasselli Chemical Company, Cleveland, Ohio; Rex Company, Toledo, Ohio; and Niagara Company, Middleport, New York.

"Scalecide" is a miscible oil. It requires no preparation, but is used at the rate of 1 gallon of "Scalecide" to 15 gallons of water. It is easy to use, and is especially good where an old orchard is badly infested with scale, as the oil has a tendency to spread or "creep" into all the little cracks and crevices of the bark. Made by B. G. Pratt Company, New York.

Results from Spraying

Returns Increased 200 %.

Value of fruit from unsprayed tree.....	\$1.90
Value of fruit from sprayed tree.....	5.70
Cost of spraying.....	.11
From Virginia Experiment Station Bulletin No. 181.	

Percentage of Infected Leaves—Elberta Peach.

2,589 leaves.....	Unsprayed,	16.87 %	curled leaves
3,005 leaves.....	Fall sprayed,	.016 %	curled leaves
2,814 leaves.....	Spring sprayed,	.050 %	curled leaves
From Cornell Experiment Station Bulletin No. 31.			

Spraying Increases Profits.

"The net profit from spraying an average-sized tree from 12 to 20 years old throughout one season, at a total cost of 30 to 50 cents, is \$3 to \$7 or more, when apples are worth \$1 per bushel."—Ohio Experiment Station Bulletin No. 191.

Results with Ben Davis Apple Trees.

Unsprayed, 42.5% wormy. Sprayed twice, 1.46% wormy.—From Ohio Experiment Station Bulletin No. 95.

Agricultural Experiment Stations

Write for information to your State Experiment Station at the address given below. They will be glad to give you the benefit of their experience.

Alabama—

College Station: Auburn.
Canebrake Station: Uniontown.
Tuskegee Station: Tuskegee Institute.

Alaska—Sitka.

Arizona—Tucson.

Arkansas—Fayetteville.

California—Berkeley.

Colorado—Fort Collins.

Connecticut—

State Station: New Haven.
Storrs Station: Storrs.

Delaware—Newark.

Florida—Gainesville.

Georgia—Experiment.

Guam—Island of Guam.

Hawaii—

Federal Station: Honolulu.
Sugar Planters' Station: Honolulu.

Idaho—Moscow.

Illinois—Urbana.

Indiana—Lafayette.

Iowa—Ames.

Kansas—Manhattan.

Kentucky—Lexington.

Louisiana—

State Station: Baton Rouge.
Sugar Station: Audubon Park.
North La. Station: Calhoun.

Maine—Orono.

Maryland—College Park.

Massachusetts—Amherst.

Michigan—East Lansing.

Minnesota—University Farm, St. Paul.

Mississippi—Agricultural College.

Missouri—

College Station: Columbia.
Fruit Station: Mountain Grove.

Montana—Bozeman.

Nebraska—Lincoln.

Nevada—Reno.

New Hampshire—Durham.

New Jersey—New Brunswick.

New Mexico—State College.

New York—

State Station: Geneva.
Cornell Station: Ithaca.

North Carolina—

College Station: West Raleigh.

State Station: Raleigh.

North Dakota—Agricultural College.

Ohio—Wooster.

Oklahoma—Stillwater.

Oregon—Corvallis.

Pennsylvania—

State College.
State College: Inst. of Animal Nutrition.

Porto Rico—Mayaguez.

Rhode Island—Kingston.

South Carolina—Clemson College.

South Dakota—Brookings.

Tennessee—Knoxville.

Texas—College Station.

Utah—Logan.

Vermont—Burlington.

Virginia—Blacksburg.

Washington—Pullman.

West Virginia—Morgantown.

Wisconsin—Madison.

Wyoming—Laramie.

Service



ANYONE who has given serious and continued thought to the subject must inevitably come to the final conclusion that real satisfaction and happiness lie in rendering service to others.

That fundamental principle is being put into effect more and more by individuals and by firms, and it has been demonstrated over and over that profits are the natural result. "A pleased customer is the best advertisement."

The service which we aim to render is not confined to supplying first-class trees and plants. The pleasure and profit to be had in fruit or ornamental trees and plants depends chiefly upon the planter himself.

Our first object, therefore, is to help you to plant judiciously—i. e., where, when and what to plant; second, how to know and how to get first-class trees and plants; third, how to plant and care for them.

In our three booklets, our Catalogue of Fruit and Ornamental Trees and Plants, "INSIDE FACTS OF PROFITABLE FRUIT-GROWING," and "HOW TO BEAUTIFY YOUR HOME GROUNDS," we have gathered from every reliable source available the information which may be required to insure your success.

Our Catalogue is sent free of charge to anyone who is interested. For the other booklets we make a nominal charge of ten cents per copy, but send them free to our customers.

Neosho Nurseries Company

Neosho, Missouri